The Southern Surgeon

Subscription in the United States, $5.00

Vol. X, No. 9

September, 1941

SURGICAL TREATMENT OF ADENOMATOSIS OF THE COLON

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DIFFUSE adenomatosis of the colon is a serious lesion which is of particular interest to the surgeon for three reasons: (1) its tendency to occur in multiple members of a family, (2) the tendency of some of the polyps to undergo malignant degeneration, and (3) other complications such as hemorrhage and obstruction.

The terms adenomatosis and polyposis are used interchangeably by most medical men to indicate a condition of the lower gastrointestinal tract characterized by the occurrence of many pedunculated growths present in one or more segments of the colon or indeed involving the whole organ. Interspersed among these pedunculated adenomas may be a number of sessile growths which develop too rapidly to form polyps. The bowel may be so thickly covered with tumors of various sorts that no normal mucous membrane may be visualized on proctoscopy and indeed frequently the entire bowel lumen takes on a raised, roughened appearance like the surface of a thick carpet.

The incidence of polypoid disease is difficult to establish, but an approximately satisfactory statistical figure may be arrived at from the diagnosis of patients suffering from disturbed function of the colon. These people examined proctoscopically and roentgenologically show in a surprisingly high percentage of cases the presence of one or more polypoid tumors scattered somewhere between the ileocecal valve and the anus.

A report by Buie on a series of 1,234 cases with polypoid disease examined over a ten year period demonstrated that one out of every 35 individuals suffering with symptoms referable to the colon had

Read before the Postgraduate Surgical Assembly, the twelfth annual meeting, of The Southeastern Surgical Congress, Richmond, March 10, 11 and 12, 1941.

this ailment. Of this total group, however, there were only 55 patients in whom the diagnosis of diffuse adenomatosis could be confirmed showing that the most widespread type of the disease is of relatively low incidence. The other groups which he studied were individuals in whom one or a few scattered polyps were discovered or patients whose pseudopolyposis was the result of inflammatory lesions like chronic ulcerative colitis. A significant fact brought out by this review was that disability resulted from multiple polypoid tumors only after the disease had been present over a long period of time. This latter statement does not indicate, of course, that the patients had known that the disease had been present for many years, because in some of the individuals carcinoma had already developed when they sought advice. The second consideration, namely, the tendency to undergo malignant degeneration focuses attention on the very possible relationship between adenomatosis and malignancy. The location of the growths whether diffuse, scattered, or involving the whole colon, usually brings out the fact that the majority of the tumors are in the lower sigmoid or rectum; a situation similar to that found in cancer.

It has long been an established fact that carcinoma occurs about 8 times as often low in the colon and in the rectum as elsewhere in the bowel.

The thesis that polyps of the colon degenerate into full grown cancers has been pursued by many investigators since Menzel first called attention to this disease in 1771. In recent years Dukes, Mummery, Cripps, FitzGibbon, Bargen, and others have added noteworthy contributions in confirmation of this hypothesis.

Moreover the disease occurs in several members of the same family in many instances and suggests thereby an hereditary factor.

In my own series of cases I have operated upon members of three families whose brothers and sisters have had a definite diagnosis of diffuse adenomatosis made by proctoscopy and radiography. Polyps of the colon, I believe, will be definitely proved to be the etiologic factor in a large percentage of cases of cancer of the colon and rectum as our information increases. These polyps may be divided roughly into congenital or adolescent polyps, and acquired polyps. Wesson and Bargen agree with this grouping in speaking of inflammatory polyps and true polyps. Polyps such as those which occur following chronic ulcerative colitis or other diffuse inflammatory lesions of the colon are entirely different considerations. The origin of acquired polyps is easily understood and is not in any way comparable pathologically to the adenomatous or true polyps which are under discussion. Concerning the latter a not inconsider-

able literature has grown up, contributions to which have been made by many clinicians and pathologists notable among whom are the names of Rokitansky, Struthers, Bargen and others.

FitzGibbon and I, in 1931, made a study of a group of cases which apparently bore out the thesis that these polyps were potentially malignant; information which has a direct bearing on treatment. These tumors histologically may be grouped into three major divisions:

1. Polyps of Group 1 are roughly nodular, pedunculated tumors, composed largely of tissue derived from the submucosa. There is little change from the normal in the epithelial covering of these polyps and there is nothing about the tumors of this group which suggests that they are more liable to undergo malignant degeneration than is the normal mucous membrane of the intestine.

2. Polyps of Group 2 show striking structural changes, however, in both the epithelial and connective tissue elements. The epithelial cells are hypertrophied, elongated, frequently undifferentiated and stain deeply. The connective tissue element has a tendency to spread out in a tree-like formation. The epithelium in this group develops rapidly and by its proliferation assumes an invasive character. That this group often undergoes malignant degeneration is easily demonstrated microscopically.

3. Group 3 polyps are but a more advanced form of Group 2. The epithelial proliferation is so rapid that the nodules undergo changes before the tumor is large enough to be elongated by peristaltic action, and consequently result most often in flat sessile tumors.

It can thus be demonstrated that there is a high malignancy potential in polypoid disease of the colon. Its occurrence segmentally or diffusely throughout the colon presents a problem which is complex surgically, but one which by its complexity warrants radical surgical maneuvers.

Symptoms and Diagnosis

The diagnosis of true adenomatosis is rarely difficult if one indulges in a careful history and supplements that with a proctoscopic and radiologic examination. The average patient will be a young adult somewhere in the second or third decade of life, although extremes of age are reported both early in youth and late in adult life. Diarrhea with varying amounts of blood and mucus is usually the chief symptom for which advice is sought. This diarrhea persists in the average case for many months and even years before the physician is consulted and may be either a continuous process or intermittent, or recurring. There is nothing particularly characteristic about the diarrhea except its persistence. Intermittent obstruction occurs commonly and is easily explained on the ground of intussusception. The larger polyps which sometimes reach the size of a lemon stimulate increased peristaltic action

and produce intussusception. By a direct tug on the bowel occasionally these polyps will be pulled off their narrow slender stem and extruded per rectum. When infection is superimposed upon this process secondary anemia and generalized symptoms of weight loss, weakness, etc., become prominent in direct ratio to the extent of the involvement of the bowel. Examination of any individual suffering from diarrhea, particularly if the diarrhea be associated with blood should begin with a proctoscopy after careful bowel preparation. Usually a proctoscopic or even a digital examination will suggest the diagnosis of multiple polyps for the tumors usually are thickest in the rectum and sigmoid.

Following proctoscopy radiologic examination using Fischer's technic of evacuating the bowel partially and inflating it with air will usually confirm the diagnosis. The polyps are demonstrated clearly and their localization is definite.

Treatment

Treatment of adenomatosis by surgical extirpation of the colon with or without ileostomy is warranted because of the frequency with which malignant degeneration takes place within the polyps. The first case upon which I did a total colectomy for adenomatosis died 18 months following the operation from recurrence of carcinoma which had been demonstrated in the resected specimen. Since the lesions have been present for a long period of time, and since usually infection and occasionally ulceration are present at the primary examination, the resulting debilitation and anemia require adequate preliminary preparatory treatment such as one institutes in dealing with frank malignancy of the lower bowel as the first step of a multiple stage maneuver. Rehabilitation and preparation of the colon are of equal importance here as in dealing with cancer and because there is usually no obstruction present this is quite easily accomplished.

The introduction of the sulfonamide group of compounds into the preliminary preparatory period has added an additional agent to the surgeon's armamentarium. Sulfanilamide was introduced some years ago by a group of New York surgeons who felt that it influenced favorably the outcome of operations on the colon. More recently Firor of Baltimore has reported a series of cases in which he has used sulfanilylguanidine. This drug, paradoxical as it is, being easy to get into solution, but difficult of absorption apparently influences the bacterial content of the bowel materially. As an agent to reduce infection in the colon, this group of compounds probably has a definite place in the preparatory period, but my own experience

with them has been too limited to express an opinion. The tried and proved methods of decompression and cleansing the colon have proved quite satisfactory, and while one should keep an open mind and accept scientific progress eagerly, it does not appear that sufficient laboratory work has been reported up to date to warrant inflexible attitudes toward these drugs.

When I first performed colectomy for adenomatosis and pseudopolyposis, I felt that a total colectomy with resection of the rectum

Figure 1—Photograph of colon containing multiple adenomas of all varieties. Several very large pedunculated tumors are shown. The polyps are thickest in the left colon. Serial sections failed to show any malignant degeneration.

following ileostomy and done in many stages was the procedure of choice.

In October,[1] 1935, I reported 6 cases operated upon for these lesions. Since then, however, it has become apparent that the indications for colectomy in the two diseases are not identical because it is possible to apply a different method of handling the rectum in adenomatosis and thereby save the sphincteric mechanism. When performing a colectomy for chronic ulcerative colitis with or with-

out pseudopolyposis, one is usually confronted with an organ which is functionless, useless, and acting as a focus of infection. There is no question then of saving the rectum and implanting the small bowel into it thus keeping intact the gastrointestinal continuity. On the other hand, when dealing with adenomatosis one may, with the cooperation of the proctologist, clear out from the rectum and lower sigmoid the invading polyps and restore this segment of the bowel to a normal function and appearance. All polyps within reach of the operator may be easily removed by fulguration and the bowel thus prepared for the subsequent anastomosis. It is for this reason, coupled with the fact that the bowel functions well after operation, that it is entirely feasible to approach the lesion in this manner. Whether or not one does primary ileostomy sidetracking the bowel and then fulgurates out the polyps, or whether one fulgurates out the polyps and eliminates the ileostomy stage is a matter of personal equation. I have done the operation by both methods and feel that it is satisfactory to eliminate the ileostomy in those cases where the fulguration can be carried out satisfactorily. However, if there is considerable infection present one must always consider ileostomy and it is well to remember that a colon filled with polyps will improve from the mere by-passing of the fecal current. If one performs an ileostomy and waits for 3 to 4 months while at the same time irrigating the colon and eliminating infection one will frequently find a great deal of difference in the appearance of the bowel by both proctoscopy and radiology.

It is my belief that the proper sequence of procedure in the majority of cases will be to fulgurate the polyps in the rectum and then do an ileosigmoidostomy low in the sigmoid as the primary operative attack. This ileosigmoidostomy may be carried out in one of two ways, (1) aseptic end-to-side anastomosis between the terminal ileum and the lower sigmoid over the Rankin clamp, or (2) by the Murphy button. The latter technic[2] Grimes and I described in 1937. The Murphy button technic is applicable either after ileostomy or as a primary type of anastomosis without ileostomy. I believe that the end-to-side method is more satisfactory in this particular instance than lateral anastomosis. Whichever technic is employed its accomplishment is not difficult by either of the above methods, or open anastomosis, and if this step is carried out after adequate preparatory measures, mortality should be low. A subsequent resection of the colon down to the point of anastomosis is best delayed for a matter of several months. Rehabilitation and reduction of infection both are materially forwarded by a prolonged period of waiting and unless malignancy has already developed in some of the polyps there is no other urgent demand

for completing the second stage of the procedure quickly. From two to three months following the ileostomy is usually a satisfactory time to perform the colectomy and in the average case more time will not be essential between stages. Following colectomy bowel habit will be somewhat changed and the patient will generally go to stool some three or four times in twenty-four hours during the first few months. Subsequently one or two stools per day has been the rule in my series and these stools are usually formed or at least semi-solid.

Of greatest importance is the postoperative routine periodic inspection of the rectum by proctoscopic examination to be sure that polyps are not recurring in this segment which has been reserved for a reservoir. In the event polyps do appear their immediate fulguration is indicated.

Mortality

Mortality statistics following colectomy for any of its numerous indications are relatively satisfactory where the procedure has been accomplished by multiple operations. To do an ileostomy and remove the colon at the same stage is too formidable a procedure even for strong youthful individuals who are not undermined by debilitating disease.

The following table shows the pathologic lesions for which I have performed colectomy in 25 cases.

Table 1

Chronic ulcerative colitis	10
Adenomatosis	13
Multiple malignant lesions	1
Megacolon	1
Total Cases	25

In this group the two most common indications were, (1) complicated chronic ulcerative colitis, and (2) adenomatosis. The megacolon case was operated upon by ileosigmoidostomy and subsequent colectomy only after multiple other attacks by surgery including a bilateral ramisection and ganglionectomy had failed. The patient with multiple malignancy had a cancer of the cecum and one of the middle sigmoid. An ileosigmoidostomy low in the sigmoid was followed by a successful resection of the colon down to the anastomosis. The patient is alive and well over three years.

In the group of chronic ulcerative colitis cases there was no mortality, although these individuals had suffered infection over a long period. No doubt their developed immunity was a factor in with-

standing the formidable surgical procedure. In the adenomatosis group there were two fatalities, (1) following a first stage ileosigmoidostomy, and (2) following the resection of the colon. The patient who died after the ileosigmoidostomy developed, I believe, a chronic sepsis from pelvic infection. Autopsy was not permitted. The second case which died following colectomy developed a pelvic abscess and died of a pulmonary embolism as demonstrated at autopsy.

SUMMARY

In a series of 25 patients subjected to colectomy by multiple stage operations there were 10 patients suffering from diffuse adenomatosis. There were two deaths in the series; one following second stage colectomy and one following ileosigmoidostomy. Diffuse adenomatosis is distinctly a surgical problem because of the tendency of the adenomas to undergo malignant degeneration. It is a disease of youth, although extremes of age are occasionally reported. Its recognition is relatively simple by use of the proctoscope and x-ray. The tendency of these polyps to undergo malignant degeneration buttresses the thesis that polyps are often the precursor of cancers of the lower gastrointestinal tract.

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CERTAIN ANATOMIC AND PHYSIOLOGIC ASPECTS OF THE INTERVERTEBRAL DISC

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ANATOMY

TO the intervertebral surfaces of the vertebral bodies cartilage plates are attached by calcified cartilage (Donohue[2]). The annulus fibrosus firmly binds the vertebral margins together by means of Sharpey fibers and fibers attaching to the cartilage plates. The number of layers varies in different regions of the body (Joplin[3]). The annulus fibrosus represents the matured intervertebral disc anlage. The space between the cartilage plates above and below and the annulus fibrosus at the periphery is occupied by the nucleus pulposus. The adult nucleus pulposus consists chiefly of fibrocartilaginous elements which have replaced the notochord cells of the primitive nucleus pulposus. The nucleus pulposus is separated from the hyaline portion of the cartilage plate, which represents the unossified portion of the cartilaginous vertebra, by the fibrocartilage envelope which originated from the intervertebral disc anlage (Keyes and Compere[4]). The inner, poorly organized layers of the annulus fibrosus form a gradual transition between the relatively unorganized nucleus pulposus and the well organized outer lamellae of the annulus fibrosus.

In the past there has been little agreement concerning the exact portions of the intervertebral disc which are displaced posteriorly to constitute the lumbar herniations or protrusions which produce the characteristic clinical syndrome. The problem is complicated both by the degenerative changes in the intervertebral disc which begin after the second decade and the additional degenerative changes which occur after posterior displacement. Surgical experience has shown that in frank posterior herniations the loose cartilage is usually plastic with the rarer finding of firm, non-plastic material resembling the annulus fibrosus.

Histologic study of the material removed in 20 frank herniations confirms the view that the well organized outer lamellae of the annulus fibrosus are generally lacking since none was present in the group. Nucleus pulposus constituted the greater proportion of the loose cartilage in each instance. However, in 16 of the 20 cases fragments of the inner, poorly organized layers of the annulus fibrosus were present. This cannot be explained by the rather loose

Presented before the meeting of the American Academy of Neurological Surgery, Cleveland, Oct. 21, 1940.

attachment of the nucleus pulposus to the inner annulus fibrosus. On the other hand, when the nucleus pulposus is violently ejected from the intervertebral disc, it must carry before it the poorly organized inner annulus fibrosus just as the lava ejected from a volcano carries before it the looser layers of the earth's crust (fig. 1-A). The nucleus pulposus thus carries ahead of it the inner layers of annulus fibrosus, the entire mass passing through the defective outer lamellae of the annulus fibrosus (fig. 1-B). In more exceptional cases the well organized outer layers of the annulus fibrosus are fractured by the herniating mass or by trauma preceding the herniation (fig. 1-C). Probably in some instances the outer lamellae of the annulus fibrosus stretch over the herniation, constituting the capsule (fig. 1-D). This could be termed an interlamellar herniation.

Physiology

It has been claimed that the intervertebral disc is devoid of blood supply from fetal life on (Keyes and Compere[4]). However, the reports of Böhmig[1] and Uebermuth[7] show conclusively that three vessels enter the fetal intervertebral disc from above and below and persist until adolescence. After these vessels degenerate, the nutrition of the disc must depend upon diffusion from neighboring vascular beds. It seems quite probable that avascularity of the adult intervertebral disc is largely responsible for the premature degenerative changes which occur in it as early as the third and fourth decades.

The function of the nucleus pulposus depends upon its plasticity which enables it, although not a true fluid, to act as a fluid. It has been erroneously stated that the nucleus pulposus is "highly expansile" (Sashin[6]). As a matter of fact, body tissues behave as essentially incompressible fluids. The nucleus pulposus could be expansile, i.e. appreciably compressible, only if it contained matter in the gaseous state. Even rubber is non-expansile when freed from the gaseous pockets which it contains. However, it remains plastic as does the nucleus pulposus.

The experiments of Petter[5] can be explained without assuming an expansile quality in the nucleus pulposus. By carefully inserting markers into the lumbar vertebrae, Petter showed that, after removal of the lumbar spine from the cadaver, each disc increased an average of 0.7 mm. in thickness. This is understandable since, prior to their removal, the intervertebral discs were subjected to the stresses of the muscles in rigor mortis. More surprising was the observation that in the isolated lumbar spine of the cadaver the thickness of the intervertebral discs increased an average of 1.2 mm.

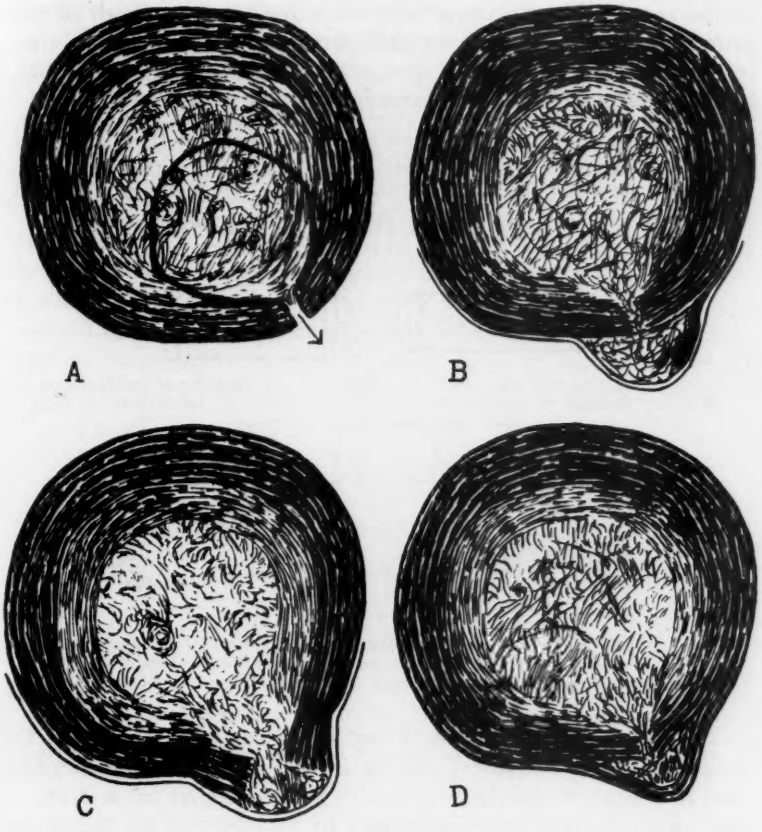

Fig. 1. The intervertebral disc is diagrammatically represented in cross-section. The outer lamellae of the annulus fibrosus are represented as dense parallel bundles, the inner lamellae as lighter bundles and the nucleus pulposus as interlacing fibers.

A. A line has been drawn around that portion of nucleus pulposus and inner lamellae of the annulus fibrosus which will rupture through the defect in the outer lamellae of the annulus fibrosus.

B. The herniation is completed.

C. A rarer type of herniation in which the outer annulus fibrosus is fractured.

D. An interlamellar herniation in which the two outermost lamellae of the annulus fibrosus have distended over the mass without rupturing.

when the annulus fibrosus was cut around. Only by subjecting the disc to 32 pounds of pressure could it be reduced to its former thickness. Although this portion of the experiment carries the implication that the nucleus pulposus is expansile, this is not truly the case. The increase in thickness of the intervertebral disc after section

of the annulus fibrosus could have been due to one or both of two factors, namely, the more vertical direction of the previously expanded annulus fibrosus (fig. 2) and the escape of nucleus pulposus between the cut edges of the annulus fibrosus.

The articulated lumbar vertebral bodies, isolated from the fresh cadaver, can hardly be bent manually, even using the knee as a fulcrum. This gives some idea of the magnitude of the forces which come into play during the rather free movements of the lumbar spine in life.

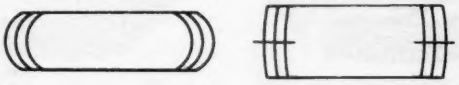

Fig. 2. Diagrammatic representation of alteration of thickness of intervertebral disc after division of annulus fibrosus (exaggerated). At left before, at right after sectioning annulus fibrosus.

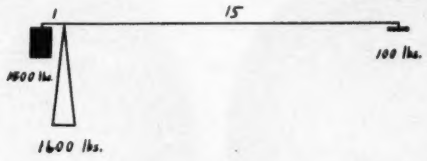

Fig. 3. Simple lever representing the large force (1500 lbs.) in the erector spinae muscles necessary to lift a weight (100 lbs.) with trunk bent forward and hands outstretched. A force of 1600 lbs. rests upon the fulcrum (lumbosacral disc).

To give some idea of the force which comes to rest upon the lumbosacral intervertebral disc in lifting, let us picture a robust man lifting a 100 pound weight with arms outstretched in front of him. It is reasonable anatomically to assume that his hands are horizontally 75 cm. in front of the center of the lumbosacral disc and that the erector spinae muscles which extend approximately 7 cm. behind this center act with a lever arm approximately 5 cm. in length. The ratio of the two lever arms is then 15:1. The moment of force of the 100 pound weight is 1500 pounds, which must be balanced by the erector spinae muscles. These muscles, acting with a lever arm of 1, must pull with an actual force of 1500 pounds, bringing a total force of 1600 pounds upon the lumbosacral disc (fig. 3). Even this figure ignores the moment of force of the head, shoulders and trunk which are in front of the fulcrum and must also be balanced by muscular effort.

When sudden force is put upon the intervertebral disc, the nucleus pulposus is displaced laterally in all directions, distending the annulus fibrosus. In this way the shock is absorbed. Much more important than this shock-absorber function is the equalization of

pressure over the entire intervertebral surface of each vertebra. Since the pressure throughout a fluid medium is uniform, any force transmitted is equally distributed over the intervertebral surface of each vertebral body. Without a fluid center within the intervertebral disc the transmitted force would be perfectly distributed in only the one position for which the disc was shaped. In a solid cylindrical disc, the force would be perfectly distributed only when the vertebral bodies remained in a straight line. If it were wedge-shaped, the force would be equally distributed to the vertebral bodies only when they remained arranged in that particular curve for which the degree of wedging was suitable. On the other hand, with a fluid center the transmitted force is uniformly distributed to the intervertebral surfaces of the vertebral bodies in a wide range of movements in all directions. Only with angulation sufficient to displace all the fluid

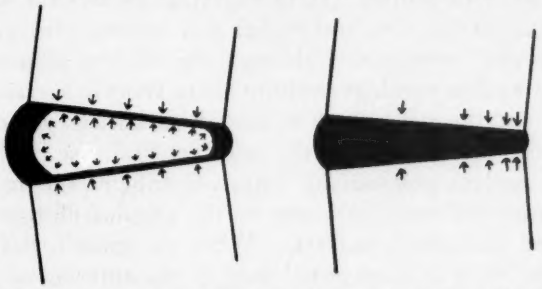

Fig. 4. Transmission of force through the intervertebral disc with (left) and without (right) a fluid nucleus pulposus. Even with moderate angulation, the fluid nucleus pulposus distributes the force evenly (arrows) while without the nucleus pulposus the force is transmitted predominantly by the margin.

medium from one extremity of the cavity with apposition of the walls at that point would the distribution become unequal. In this instance the transmitted force would be disproportionately borne by the area in which the cavity was obliterated. It is true that a solid elastic intervertebral disc would serve to distribute the transmitted force in a narrow range of motion because its elasticity indicates a limited amount of fluidity. However, only by means of a fluid nucleus pulposus could force be transmitted with even distribution through a wide range of spinal movements.

From what has been said above it is apparent that the annulus fibrosus must resist the pressures which tend to displace the nucleus pulposus. In addition it binds the margins of the vertebral bodies firmly together and thus helps to prevent excessive angulation at a single articulation. It can be seen then that the annulus fibrosus has usually either to withstand pressure tending to distend it or tension in a direction parallel to the vertebral column. By its

anatomic configuration it is equipped to withstand these forces. When injury to the annulus fibrosus or the laminae of hyaline cartilage has allowed the nucleus pulposus to escape, the annulus fibrosus is subjected to forces which are alien to it. It becomes then simply a washer resisting direct force. With the fluid medium for evenly distributing the transmitted force gone, movements bring force to bear on a small part of the intervertebral disc at one time (fig. 4). The disc is then in a position to be ground between the opposing vertebral bodies. If the vertebral body is weakened by disease, it too may be ground away.

The fluid nucleus pulposus can distribute the transmitted force evenly only when the intervertebral surfaces of the vertebral bodies are moderately flat, allowing it to flow from one portion of the enclosed cavity to another. In decalcifying diseases the intervertebral surfaces of the vertebral bodies may become concave because of the pressure transmitted through the nucleus pulposus. The laminae of hyaline cartilage conform to the concave surfaces as they give way, and there is no true escape of the nucleus pulposus. But nevertheless, the function of the intervertebral disc is altered because the nucleus pulposus no longer distributes the force. Any force transmitted must be borne by the annulus fibrosus and the margins of the concave surfaces. When the spine is flexed or extended, the force is transmitted only at the anterior or posterior portion of the ring with a grinding effect on both the annulus fibrosus and the already decalcified vertebrae.

Summary and Conclusions

1. The inner, poorly organized layers of the annulus fibrosus are often present along with nuclear material in posterior herniations of the nucleus pulposus.

2. The degeneration of the blood vessels of the intervertebral disc at about the time of adolescence contributes to its early degenerative changes.

3. The nucleus pulposus is plastic but not expansile.

4. The intervertebral disc can evenly distribute the force transmitted through the vertebral column only when the nucleus pulposus preserves its fluid consistency and occupies its normal site.

5. When the nucleus pulposus is displaced or altered in consistency, the annulus fibrosus is subjected to compression from forces which it is not anatomically constituted to withstand.

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THE TREATMENT OF RECENT COMPOUND WOUNDS

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THE care of traumatic wounds is, undoubtedly, second only to the costectomy performed on Adam, the oldest form of surgery. The great figures of surgery, probably before and certainly after Hippocrates, down through Paré and Larrey, were those who accompanied the armies and treated the wounded. Their minds and energies were directed, almost exclusively, toward the phenomena related to the healing of wounds, which must always be the foundation upon which all surgery rests. The birth of the triplets, anesthesia, asepsis and hemostasis, during the nineteenth century opened up new avenues which led surgery safely into the more interesting recesses of the body. The possibilities of elective meddling with the vital innards were so great that the fundamentals of wound healing were neglected in the efforts to devise new ways of removing, rearranging and replacing the cogs and springs without too greatly impairing the ticking of the watch. Only a few, such as Halsted, carried with them in their tinkering, a real interest in the principles and details which contribute to wound healing. Finally, however, after surgery had entered the brain and the heart, the last reaches of the body, the first phase of the present world war and the twenty years of intervening American industrial and automotive development brought our attention back to the traumatic wound. It is still the same wound, whether inflicted by a stone ax, a bomb fragment or a V-8, and is still the most frequent surgical condition with which we have to deal.

The ability to care properly for such a wound will benefit far more patients than will the surgeon's ability to remove a stomach or a thyroid gland. Yet, all of you who have contact with medical students, interns and residents, know how much more easily they can become interested in a discussion of the relative merits of the Bilroth-I, Polya, or Hofmeister than of the open or closed treatment of a compound fracture. To many, the treatment of a wound simply means the liberal application of whatever red, green or purple paint the last detail man has extolled, some stitches and a dressing. In many hospitals, the care of even major compound wounds is turned over to inexperienced persons whom no one would

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Read before the Postgraduate Surgical Assembly, the twelfth annual convention, of The Southeastern Surgical Congress, Richmond, March 10, 11 and 12, 1941.

entrust with an appendectomy. Sumner Koch, in a recent editorial says:

"In recent years we have often heard the terms 'industrial surgery,' 'traumatic surgery,' 'office surgery,' etc., and have not heard often enough the term 'good surgery.' There is only one type of surgery that deserves emphasis—the good surgery that the injured patient requires, no matter where or how he may have been injured. There must be one best method of treating a compound injury, and that method cannot be learned in short 'refresher courses' but only from teaching and demonstration in medical school, from first hand observation and practice in hospital internship and residency, and finally from persistent and conscientious application of sound surgical principles in daily practice.

"War does drive home some simple lessons and basic principles that are too often neglected in medical school and hospital because of the lure of more appealing tasks. There is no new magic in petrolatum and plaster, but there is magic in undisturbed rest and freedom from exposure to the constant reinfection too often introduced into open wounds by careless fingers and droplets from uncovered mouths and noses. There is no new magic in hasty excision of devitalized wound edges and immediate closure of an open wound, perhaps after filling it with sulfanilamide crystals. There may be some magic in laying sulfanilamide crystals under the occluding dressing of an open wound that cannot be surgically treated immediately after injury, so as to produce temporary bacteriostasis, but the real magic lies in transforming contaminated wounds into clean surgical wounds in the simplest possible way and without mechanical or chemical trauma of the living tissue upon which healing depends."

These same principles apply, no matter whether it is a simple small laceration or a compound fracture of the skull or femur.

In the treatment of an injured person our efforts must be directed, in their order of importance, toward (1) saving the life of the patient, (2) the life of the injured member, (3) the function, and (4) the form of that member. The treatment of abdominal, thoracic or intracranial injuries accompanying a wound are not within the scope of this paper. As far as the wound itself is concerned, it may endanger life because of hemorrhage, shock or sepsis.

Most traumatic wounds are contaminated or potentially infected. After about eight hours the bacteria present in the wound have begun to propagate and spread and the contaminated wound has become an infected wound. Treatment should be carried out before this occurs. The goal of treatment of wounds is primary healing or healing by first intention. To attain primary healing we must have an absence of clinical infection and a minimum of inflammatory reaction in the wound. Inflammatory reaction is caused by, (1) bacterial infection, (2) foreign bodies, and (3) dead tissue, including blood clot.

As stated by Reid, "Clinical infection in a wound is by no means a

matter of the presence of bacterial organisms." Proper conditions for their growth must be present. They must have food and protection from the bactericidal processes of the body. This food and protection is best provided by dead tissue and foreign bodies. A fresh wound in which there is a minimum of dead tissue and foreign bodies will heal primarily even in the presence of a reasonable number of organisms. This is shown daily in every operating room in the country where elective incisions, such as for hernia, heal regularly by first intention, even when contaminated by numerous organisms from the air of the operating room and elsewhere.

Our aim in the treatment of an open contaminated wound should be to convert it into a clean closed wound such as follows a properly performed operation for hernia. If this is done primary healing will follow. Such a result will seldom be obtained by the common practice of flooding the wound with an irritating antiseptic and suturing it in layers about a drain. Primary healing following such a procedure occurs in spite of, rather than because of, the treatment.

Ideally, treatment should be started immediately and at the place of injury. Dangerous hemorrhage should, of course, be cared for at once, but meddlesome direct attempts at hemostasis under nonsterile conditions usually do more harm than good. A sterile dressing should be applied to the wound at the earliest possible moment to prevent further contamination and may be used to control hemorrhage by pressure. No antiseptics should be applied unless it be a dusting of the wound surfaces with sulfanilamide or sulfathiazole powder if transportation to a treatment center is to be delayed. Good transportation splints should be applied, even in the absence of fracture. You all have seen air carried into the tissues a distance of several inches from a wound by motion of an extremity during transportation. Contamination may be carried in the same way. The patient should be kept warm during transportation and all movement should be as gentle as possible. Appropriate treatment for shock may be carried out en route.

On arrival at the hospital or other treatment center the same gentle care should be exercised. Too often we see patients whose splints and dressings are removed for inspection immediately on admission to the hospital and the patient then moved from stretcher to bed, bed to stretcher, stretcher to x-ray table, etc. By actual count, some patients are lifted from one resting place to another as many as twelve or fourteen times before treatment of the wound is commenced. Sphygmomanometer readings taken under such conditions will show a drop of several points following each such movement of a shocked patient.

Never forget that a compound wound is just as much of an emergency as a case of perforated ulcer or strangulated hernia. As such, the patient should be transported to the operating room as expeditiously and with as little excess motion as possible. Neither the original dressing nor the splint should be removed until the patient is on the operating table. Any necessary x-ray or other examinations should be performed without removing the patient from the original stretcher. The treatment of shock can be carried out as well on a stretcher as in bed and, as a matter of fact, it is only in very exceptional cases that surgery must be delayed in order to treat shock. Shock and the wound can and should be treated concurrently. On the operating table the patient can be kept as warm as in bed and blood, plasma or other fluids administered while the operation is going on. Regional or local anesthesia are used whenever practicable and are preferably administered before the dressing and splint are removed. Regional anesthesia minimizes additional shock and, what is even more important, removes the need for hurry, which many surgeons feel when the patient is under general anesthesia. The proper cleaning up of a compound wound is a major surgical procedure which cannot be done hurriedly, but must be carried out with all the care and ritual of an operation such as thyroidectomy or cholecystectomy. If the patient is under regional anesthesia, is being kept warm and dry, and is having shock treated by appropriate measures, there is no need for hurry or neglect of details.

The splint and dressing are now removed and a careful examination of the wound carried out by the masked and gloved surgeon, in order to estimate the damage and map out the contemplated treatment. The question of amputation of a badly mangled extremity may come up at this time. It cannot be too strongly emphasized that primary amputation is almost never justified except in case of complete absence of circulation distal to the wound. It is surprising how many seemingly hopelessly damaged extremities may be saved by careful treatment.

The limb is now placed in the position in which it is to rest after operation. That is, in case of a fracture of a leg, traction is applied by the fracture table or appropriate apparatus in the proper posture, thus minimizing postoperative motion in the wounded area. Using sterile gloves, the preparation of the field is carried out. This preparation should extend in all directions from the wound as far as practical. If the skin is excessively dirty, a sterile scrub brush may be used with liberal amounts of soap and water. Scrubbing with gauze or brush should be done centrifugally from the wound, using repeated changes of soapy sponges, and taking care that no dirty fluid contaminates the wound. However, scrubbing out of a lacera-

tion with soap and water is indicated in many cases and is an excellent way of removing gross dirt. This stage of skin preparation requires at least ten minutes. Without removing the last soap suds, the field is shaved centrifugally with a sterile razor. Any excess soap is removed with sterile water and the cleansing repeated with three changes of ether sponges. If one is addicted to antiseptics, any good one may be now painted on the skin but not into the wound. Gown and gloves are now changed and the field draped for surgery.

The remainder of the debridement is carried out from this point, under a constant running stream of sterile saline, 5 to 6,000 c.c., of which will be used. It is well to make provision for this large amount of fluid to prevent its running down the table top and soaking the patient. A most effective gadget has been described by Henry Marble. This is a galvanized iron pan 8 by 18 inches by 2½ inches deep, with a removable ¼-inch mesh hardware cloth top. A rubber tube may be attached to a spout at one end of the pan to carry irrigating fluid into a bucket below the table. This sterile pan is placed directly beneath the extremity so that all fluid is caught in the pan and does not soak the drapes and patient. The bruised and dirty skin edges are removed by an incision about 2 mm. from the borders of the wound. If the external wound is small it is enlarged so that all pockets of the deeper wound may be opened widely. The nozzle of the irrigating hose is now placed in the depths of the wound so that a constant flow of fluid is maintained upward and outward from the depths. Fat and muscle are resected freely, removing all soiled or contused tissue until freshly bleeding, healthy tissue is reached. Fascia which has been deprived of its blood supply is carefully resected as are the soiled surfaces of tendon and bone. This dissection may be done much more accurately with a scalpel than with a scissors. Care must be taken not to divide uninjured nerves and large vessels. Small, loose fragments of bone may be removed, but any large fragments should be left, even though apparently deprived of blood supply. Even if completely detached they may be cleansed and replaced. The constant stream of saline floats up torn shreds of tissue which have poor blood supplies. They are thus easily recognized and removed. Adequate incisions are made in the fascia so that there may be no tension beneath it later. Hemostasis is obtained principally by pressure. A minimum of ties are used on the larger vessels and should be of the smallest possible size of catgut (4-0), or A-silk.

We now have a clean wound with a minimum of bacteria, no dead tissue and a minimum of foreign bodies in the form of ties on vessels. Closure is now in order and should be accomplished with a minimum

of foreign bodies and without strangling the tissue with sutures. Therefore, the only structures which may permissibly be sutured in the depth of the wound are nerves and important tendons. According to some authorities such as Boehler and Koch, even these should be left until a later time. Most surgeons instinctively desire to suture muscle and fascial planes in layers. This can only be done at the cost of blocking the exit of serum and of leaving the foreign suture material and strangled dead tissue in the wound. The suturing of fascia allows the accumulation of tension beneath it which may be fatal to good wound healing. Moreover, no surgeon confronted with a subcutaneous wound, such as a dislocation, in which muscles, ligaments and fasciae are torn, would think of making an incision in order to suture these structures in layers. Therefore, deep sutures are unnecessary, even open wounds. We close the skin only, with interrupted rather than continuous sutures. These sutures are spaced about ¾ inch apart to allow free exit of blood and serum from the depths of the wound and to avoid tension in the deeper tissues. The skin should close without tension. If it is impossible to close without tension, relaxation incisions should be made to allow such closure. Non-capillary suture material, such as black silk or fine dermal, should be used. Recently, before closure, we have implanted sulfanilamide or sulfathiazole powder in the wound in amounts of 5 to 10 Gm. This has, perhaps, slightly improved our incidence of primary healing, but it is my definite feeling that careful attention to the details of debridement and cleansing are of much more importance.

The subject of drainage inevitably comes up here. Any drain is a foreign body and as such favors bacterial growth. It is axiomatic that if a drain is inserted in any wound, no matter how clean, drainage will occur. The interrupted skin sutures allow ample opportunity for escape of blood and serum from the depths of the wound, but do not allow the reverse flow which may occur along a drain. If the wound has not been cleaned up enough to close without drainage, it is too dirty to close at all and should be left wide open with vaseline gauze packing or Carrell-Dakin tubes. We follow this procedure in those wounds which are first treated after eight or twelve hours and are thus infected rather than contaminated, or if for some reason or other, adequate debridement has not been carried out.

Proper after care is quite as important as the rest of the procedure. A minimum of dressing is used over the wound. If flies and trauma can be excluded, I prefer to leave the wound uncovered under an electric bake. This keeps the wound dry and prevents maceration of the skin with extension of infection into the wound along the

sutures. With the open treatment the escaping blood and serum coagulate to form a tight bacteria-proof covering under which primary healing can take place.

The advantages of proper rest in the healing of wounds were known as far back as Hippocrates and were particularly stressed by Thomas, Billroth and Boehler. It is usually advisable in extensive wounds, even in the absence of fractures, to immobilize the part by splints or plaster casts as advised by Orr. This type of rest for healing tissues cannot be overemphasized and is one of the most important parts of any method of treatment whether the wound is sutured or packed open.

Prophylactic gas and tetanus antitoxin should be administered if the wound has been sustained under conditions likely to favor such infection, particularly wounds from the street, barnyard or coal mine.

Summary and Conclusions

The proper treatment of traumatic wounds depends upon careful detailed application of well known and old principles of surgery. Careful adherence to these principles will insure success, while neglect of them will result in disaster even though one goes through the motions of debridement, local sulfanilamide application, Orr dressing or other modern catchwords. The treatment of wounds is the most frequent form of surgery and should not be relegated to the background and turned over to inexperienced personnel as is so often the case, even in our best hospitals.

OBSTRUCTIVE JAUNDICE CAUSED BY PERFORATING DUODENAL ULCER

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THE incidence of obstructive jaundice in our clinic is 1 in 1200 general admissions. In spite of its relative rarity it is a condition of such potential seriousness that any data bearing on its etiology and its treatment at once assume importance for the clinician and surgeon.

Stone in the common duct is the most frequent cause of obstructive jaundice. The other causes of obstructive jaundice fall into two main groups—inflammatory processes and neoplasms.

Neoplasms may be either in the duodenum, the head of the pancreas or in the common duct and may be either benign or malignant —although the malignant tumors are far more frequent causes of obstructive jaundice. A malignant growth in the head of the pancreas or at the ampulla is the most frequent cause next to common duct stone.[1]

Inflammatory processes in the gallbladder and head of the pancreas and their consequent scar formation comprise the next most important group of causes.

The least frequent cause of obstructive jaundice is ulcer of the duodenum.

Parks and Fitz[2] reporting in 1939 a case of duodenal ulcer with hemorrhage complicated by jaundice could find only 35 cases on record in the literature.[3-14] In my search through their bibliography I do not find any cases reported in which a perforation of the ulcer seemed to be the causative factor. Walters and Snell[15] do not mention it in their recent book, *Diseases of the Gallbladder and Bile Ducts*. Perhaps such conditions have been reported, but up to the present time I have been unable to locate them.

In the past year I have had occasion to observe and operate on a case of obstructive jaundice which was caused by a discrete perforating ulcer on the posterior wall of the duodenum situated immediately in front of the common duct. This case presents many interesting features from the standpoint of diagnosis and surgical management.

Report of Case

Mr. F. B., aged 33, entered the clinic on Nov. 7, 1940, complaining of jaundice of three months' duration. He gave no history of typhoid fever, or

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Presented before the Texas Surgical Society, Temple, April 7 and 8, 1941.

other infectious disease of any importance. There was no history of injury and the only operation was tonsillectomy in 1936.

The presenting illness dated back to three months prior to entry at which time he began to feel bad; after a few days the patient's mother noted an icteric tint in the conjunctivae. Jaundice developed rapidly within a few days following this and persisted unabated to the date of admission. There was no history of gallbladder colic or of stomach disorder other than occasional mild discomfort in the epigastrium about an hour following meals but no chronic dyspepsia or indigestion. There was no history of chills or fever and no history of vomiting or of hemorrhages. There had been a weight loss of 15 pounds during the present illness. The patient believed the intensity of the jaundice to be constant but his mother thought that she had noted a definite fluctuation. Itching had been a constant symptom. There had been moderate constipation with light-colored stools throughout the present illness. There had been no real pain at any time. His home doctors had treated him for catarrhal jaundice.

Physical examination revealed a white man about 30 years of age, markedly jaundiced but not acutely ill. The conjunctivae and mucous membranes and skin of the body showed a marked greenish yellow discoloration. The abdomen was flat with no enlarged vessels in the abdominal wall. The liver extended two finger-breadths below the costal margin. In the right upper quadrant there was a palpable mass 5 to 6 cm. in diameter which was not markedly tender, and which apparently was the gallbladder. This later proved to be an enlarged quadrate lobe of the liver. His blood pressure was 130/70, temperature 98, pulse 68, respirations 18. Physical examination other than the abdomen, skin and mucous membranes was negative.

Laboratory reports revealed an essentially normal blood count. Both direct and indirect van den Bergh reactions were positive with a serum bilirubin ranging from 14.3 to 15 mg. on various examinations. The blood Wassermann was negative. Urinalysis showed bile strongly present. Examination of the feces showed urobilinogen present at one examination. The prothrombin time was normal after the administration of vitamin K. The hippuric acid liver function test could not be completed because of nausea following ingestion of the sodium benzoate. Because of the jaundice a dye retention test was not done and a galactose tolerance test was not carried out since the condition of the patient was apparently good. The electrocardiogram revealed only a sinus arrythmia. X-rays of the gallbladder without dye were negative. X-rays of the esophagus, stomach and duodenum were negative. The chest was negative and the heart was not enlarged.

Blood and Bile Examinations: On November 7 studies of the patient's blood, 13.5 Gm. hemoglobin; 4,600,000 red cells; 6,250 white blood cells; 63 per cent neutrophils; 35 per cent lymphocytes; 2 per cent eosinophils. One week later the red blood count had dropped to 4,100,000 and the hemoglobin to 12. Gm. although a blood transfusion of 500 c.c. of citrated blood had been given three days prior. Another transfusion of 500 c.c. of blood was given on November 15. On the 19th, the day before the operation, the red cells were 3,970,000 and the hemoglobin 11.2 Gm.

Serum bilirubin on November 8 was direct-positive, indirect-positive 15. mg. per 100 c.c.; on November 14 serum bilirubin direct-positive, indirect-positive 14.3 mg. Serum bilirubin after operation on November 22 was direct-positive, indirect-positive 5.9 mg. per 100 c.c.; on November 23, indirect-positive 5.6 mg.; on November 26, indirect-positive 3 mg. and on December 3, three days before dismissal, the serum bilirubin was indirect-positive 3.6 mg. per 100 c.c.

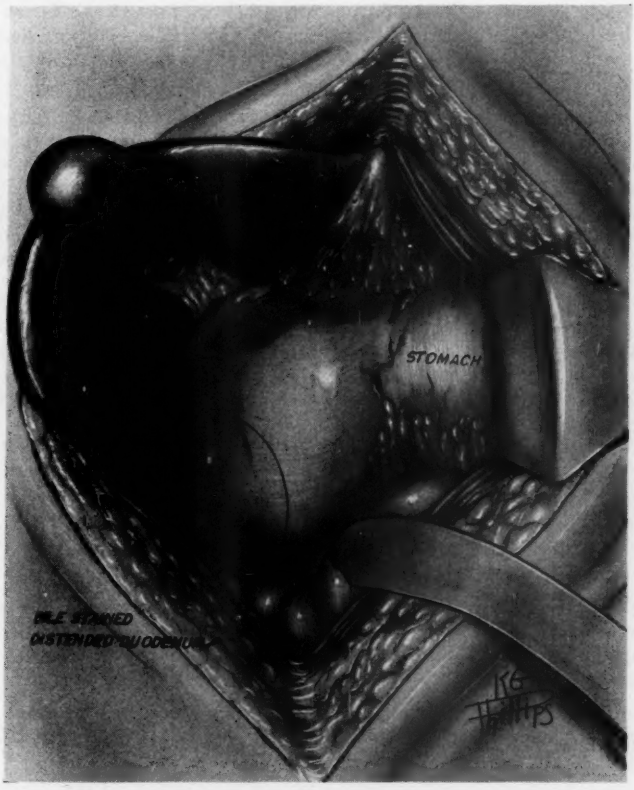

Fig. 1. Markedly swollen and edematous duodenum. Note dark area of subserous bile infiltration; also, small white patch overlying anterior ulcer.

Four days after admission a tentative diagnosis was made of obstructive jaundice probably due to malignancy. After further investigation, a more detailed history, and further consideration, a final preoperative diagnosis was made of obstructive jaundice probably due to common duct stone—possibly to benign tumor at the ampulla of Vater.

The patient was advised to have a right rectus exploration with removal of stone and establishment of Bas intraductal drainage if a stone was found—and if a tumor of the ampulla, then a local excision, with Bas drainage if benign, or a Whipple multiple stage resection, if malignant.

The patient elected to have the operation and after thorough preparation with intravenous and oral glucose and calcium and blood transfusions, the abdomen was explored under avertin, 80 mg. per kilogram, and ethylene anesthesia; one ounce of ether was used while closing the incision.

Abdominal Findings: On opening the abdomen it was found that the liver was slightly enlarged, and more yellow than normal. Lying immediately against its lower edge was a tremendously edematous and distended duodenum.

The anterior surface of the duodenum was nearly as far anterior as the edge of the liver. The gallbladder was not visible and the mass which had previously been felt was manifestly an enlarged quadrate lobe of the liver which extended down well below the rest of the liver.

By retracting the duodenum medially the gallbladder could be seen in its normal fossa, normal in appearance and not distended. There were no stones palpable in it. By retracting the gallbladder and the duodenum the common bile duct could be seen and although it appeared round and full of fluid there was no apparent enlargement; it was only about 1 cm. in diameter. Careful palpation of the common bile duct revealed no stone, and palpation of the pancreas revealed no tumors or increased density of the head of the pancreas.

Description of the Duodenum: The duodenum seemed enormously dilated and the walls exceedingly thick. Beneath the serosa along the sides of the duodenum and extending well up onto the anterior surface there were greenish patches of discoloration of a dark green color suggestive of bile having been extravasated into the duodenal walls. There was a small plaque-like blanched area on the anterior wall of the first portion of the duodenum about 3 cm. distal to the pyloric valve which was suggestive of an old ulcer scar. Because of the intense edema there was much uncertainty as to whether or not this was a scar. There was no palpable induration around it.

The serosa of the duodenum was raised by a watery edema. It looked everywhere like peritoneum recently injected with local anesthetic. Where not stained with bile, it looked red, inflamed.

Deep palpation revealed a small crater-like tumor on the back wall of the duodenum in the region near the head of the pancreas where one usually finds the ampulla of Vater. By palpation it seemed about 1.5 cm. in diameter—and flattened anteroposteriorly.

No enlarged glands were palpable although there were two or three small ones palpable along the common duct—up higher, near the entrance of the cystic duct.

The stomach was normal on palpation and inspection and the rest of the abdomen was normal on palpation.

Operative Procedure: It was then decided to explore the ampulla by transduodenal approach and a vertical incision 5 or 6 cm. long was made on the anterior surface of the duodenum about 1 cm. external to the blanched area.

On opening the duodenum and after the duodenal contents had been removed by suction a small ulcer was found on the anterior wall immediately adjacent to the incised margin. This ulcer was about 7 mm. in diameter and was just underneath the indefinite scar previously described. On the posterior wall of the second portion of the duodenum there was found a rather large tumor-like ulcer of the perforating type about 12 mm. in diameter. This ulcer was lying immediately over the common duct and at first it was thought that it was at the ampulla, but on retracting the anterior wall further downward the ampulla was palpated and could be seen about 2 cm. below the posterior ulcer. Bile in very small amounts could be seen emerging from it at intervals when pressure was made on the common duct higher up. There was moderate induration around the posterior ulcer with the induration extending down around the duct to the ampulla.

The crater of the ulcer had a yellowish gray appearance and there seemed to well up into the crater cavity a thin yellowish gray exudate with a slightly

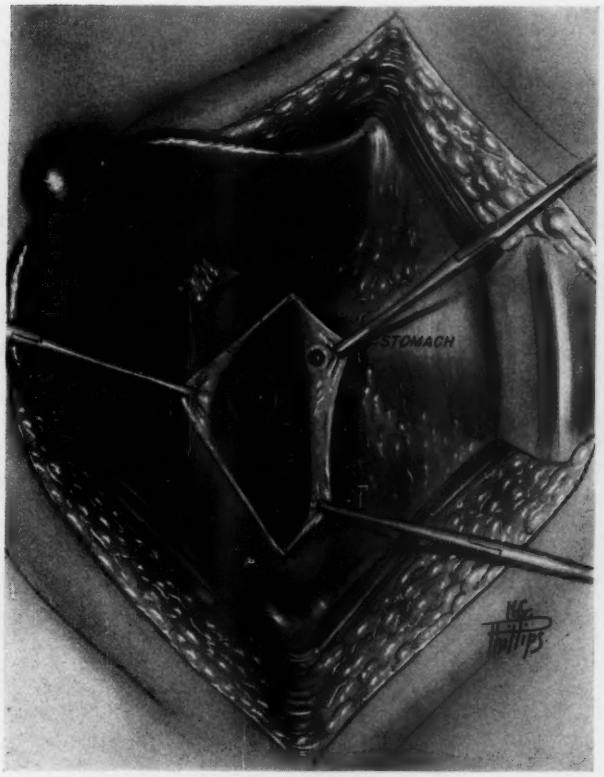

Fig. 2. Incised duodenum showing anterior ulcer and posterior ulcer overlying common duct.

greenish tint. This was in distinct contrast to the bile of a dark golden greenish color which was expressed from the ampulla. The crater cavity was 2 to 3 mm. in depth.

The smaller ulcer on the anterior surface was shallow and a typical duodenal ulcer.

The mucosal walls of the duodenum everywhere were normal in appearance and there were no signs of a diffuse or localized duodenitis. Furthermore, the lumen of the duodenum was only slightly larger than normal in size and diameter and somewhat belied the distended external appearance. This was undoubtedly due to the marked edema, the walls being from 1 to 1.5 cm. in thickness.

Palpation of the head of the pancreas through the duodenum indicated only slight induration and failed to reveal any tumors. *An operative diagnosis* was then made of perforating duodenal ulcer with inflammatory obstruction of the common bile duct.

The question then arose as to whether the ulcer had perforated through into

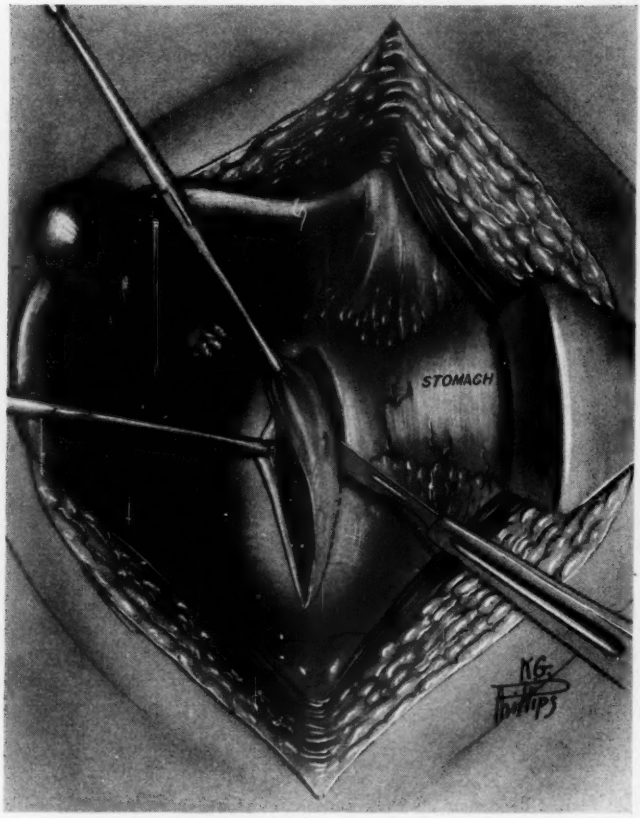

Fig. 3. Excision anterior ulcer.

the common duct or whether the bile stain in the anterior duodenal walls was due to bile in the duodenum which had leaked out through the perforating ulcer into the duodenal tissues. It was our conclusion that there probably was not a perforation into the common duct, since the exudate coming out of the crater of the ulcer looked more like discolored lymphatic fluid than bile.

Because of the uncertainty of the extent of the perforation and the proximity of the ulcer to the common duct and the ampulla, I finally decided that it would be safest not to disturb this ulcer, but to depend on the healing of the ulcer by short-circuiting of food with a gastroenterostomy and bathing the ulcer with bile as it would emerge through a gallbladder anastomotic opening.

Accordingly, the small anterior ulcer, which was only 1 cm. from the incision line, was excised; the upper portion of the duodenal incision was closed; the gallbladder was anastomosed to the inferior portion of the incision, as in fig. 4; and a posterior gastroenterostomy was performed. The abdomen was then closed in the usual manner.

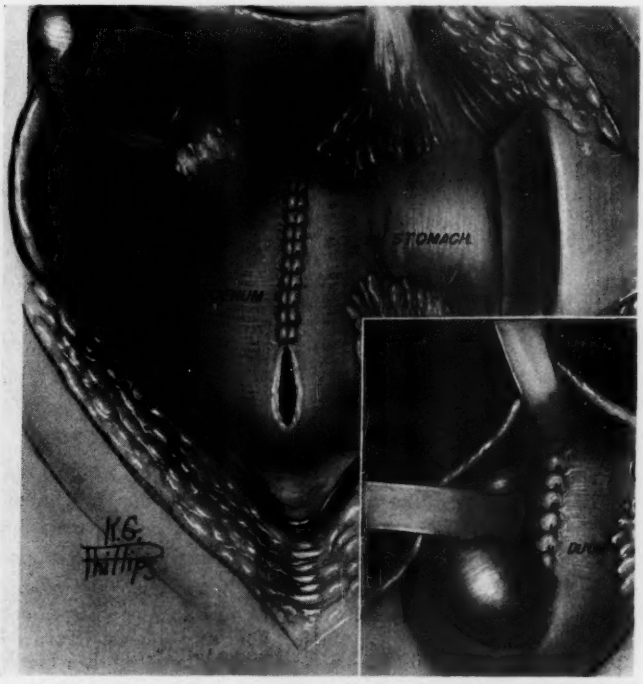

Fig. 4. Partially closed anterior duodenal incision. Insert illustrating completed cholecystoduodenostomy.

A continuous intravenous infusion of 1,000 c.c. of 5 per cent glucose was started shortly after the beginning of the operation, and 500 c.c. of citrated blood was given through the same needle near the end of the operation. The operation lasted two hours and fifteen minutes and the patient was in good condition throughout.

The patient had no signs of shock and the highest postoperative temperature was 100.6. He had an uneventful convalescence and was dismissed on the sixteenth day with his wound completely healed.

Return Postoperative Examination: The patient returned for observation on Feb. 24, 1941, three months after operation. He had gained 20 pounds; he had been working six hours daily with a half hour rest after lunch; he had eaten a smooth diet with broiled meats only and very few vegetables. He stated that he felt fine, but did not seem as strong as he would like. He had no indigestion or discomfort after eating. His only pain had been the usual sharp darting pains in the external scar.

On physical examination he appeared normal except thin. There was no abdominal tenderness, the liver was not palpable and the scar was in good condition.

Laboratory tests showed a normal serum bilirubin and a normal blood count of 4,840,000 red cells, 14.0 Gm. hemoglobin, white cell count of 7,400; a

Fig. 5. Diagrammatic illustration of completed operation.

normal urine with no trace of bile; van den Bergh direct-negative, indirect-positive of 2.25 mg. per 100 c.c.—and no retention of the liver function dye after one hour.

The x-ray of the gallbladder with oral dye showed a faint outline of the gallbladder but the dye would not concentrate in the gallbladder.

X-ray of the stomach showed a normally functioning gastroenterostomy, with barium also flowing freely through a deformed duodenal cap. Mucosal markings in the descending duodenum were normal and no ulcer crater could be demonstrated. The barium did not show up in the gallbladder.

Discussion

A. Diagnosis. The diagnosis of obstructive jaundice presented no problem, since the blood serum bilirubin test quickly established the fact that the jaundice was of the obstructive type.

The real problem of diagnosis was to discover the causative factor producing the obstruction. The establishment of the cause was important both from the standpoint of planning the operative procedure for relief of the obstruction and from the standpoint of anticipating the prognosis in advance of operation.

The long history of jaundice, its persistence, the lack of fever, the absence of pain and the weight loss undoubtedly led the clinicians making the tentative diagnosis to decide on malignancy.

On the other hand, after a more careful review of the history, the mother's observation that the jaundice was somewhat variable in intensity, the finding of bile in one stool examination, the failure of the serum bilirubin to increase during the ten days of observation, the patient's youth and the lack of emaciation after three

months' illness led me to believe that the causative factor was benign and probably a stone in the common duct.

What appeared to be a palpable gallbladder was evidence against stone according to Courvoisier's law, namely, that distention of the gallbladder is rarely associated with obstruction due to common duct stone, whereas obstruction due to other causes than stone is usually accompanied by dilatation of the gallbladder. The failure of distention of the gallbladder in cases of stone in the common duct may be due either to a fibrosis of the walls of the gallbladder or to the ball and socket valve effect of a stone at the ampulla. However, the law is a general rule with exceptions, consequently the palpation of what was thought to be a distended gallbladder would not rule out stone.

A benign polyp at the ampulla was considered as a possible cause of the shifting jaundice.

A benign or malignant tumor in the head of the pancreas was considered, but not seriously, since with a tumor of the pancreas the pressure should have been constant with a progressively increasing degree of jaundice—and a much greater weight loss.

Frankly, the question of duodenal ulcer was not considered as a probable cause, since there was so little in the past history suggestive of ulcer and because the x-rays of the stomach and duodenum were negative. After the operation one could readily understand how the intense edema obliterated any ulcer deformities which might otherwise have been observed by the roentgenologists.

The outstanding things about this proved obstructive jaundice, which both the patient and his mother stated was as profound after the first week as it was at the time of entry three months after onset, were:

1: The absence of marked debility,
2: The absence of marked weight loss,
3: The apparent general well-being of a patient who had been sick this length of time,
4: The slight variations in the degree of jaundice according to the parent's story.

All of these facts led me to believe that the obstruction of the common bile duct was not complete. The explanation in this case is that the inflammatory process and the edema surrounding the common duct varied from time to time.

B. Surgical Procedure: The posterior ulcer was not disturbed because, first, it was believed that the ulcer would heal spontaneously if the food and acid stomach contents were short-circuited

by a gastroenterostomy; second, it was believed a greater chance of stricture of the common duct might result if the ulcer were disturbed in any attempted closure; third, the presence or absence of choledochoduodenal fistula was not definitely determined; fourth, the more or less continuous presence of a large quantity of bile discharged both through the ampulla and the opening into the gallbladder immediately over the ulcerated area would probably neutralize any stomach acids sufficiently to permit healing of the ulcer.

A posterior gastroenterostomy was performed because of the tendency to ulcer formation as indicated by the presence of more than one ulcer in the duodenum, and more specifically, to aid in healing of the posterior wall ulcer.

SUMMARY

Obstructive jaundice is rarely accompanied by or produced by duodenal ulcer.

In spite of the rarity of duodenal ulcer as a causative factor in obstructive jaundice it should be kept in mind by the diagnostician and one should go carefully into the possible history of preceding ulcer.

In a young individual with a prolonged siege of jaundice of the obstructive type one should consider a perforating duodenal ulcer as a possible cause of the obstruction.

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CHEMOTHERAPY OF INFECTIONS OF THE CENTRAL NERVOUS SYSTEM

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THE search for a chemical agent or compound that would be bactericidal when given by mouth or intravenously, began in the early part of the twentieth century. During this time a number of chemical substances were produced that exerted a favorable effect on infections of the urinary organs. There was one, hexamethylenamine, which for a while was used extensively in infections of the central nervous system but the results were inconclusive and it was discarded.

In the early 1920's, Young of Baltimore introduced a red mercurial preparation as an intravenous antiseptic or bactericidal agent. About the same time a 1 per cent solution of gentian violet also gained temporary prominence. Many favorable results were reported at first, but careful studies failed to substantiate them and these two drugs have been discarded. In February 1935, Domagk, Director of the Experimental-Pathological Laboratory of a large German chemical company, published the results of his experiments with the use of the sulfonamido-azo dyes on streptococcal infections in mice. These compounds were found to be non-toxic and to have no disinfectant action on streptococci in vitro but had great activity on streptococcal infections.

The substance found to be effective was a red dye of the sulfonamido-azo group known as prontosil. The product marketed in the United States was a neutral soluble product known as a prontosil-soluble.

Sulfanilamide, para-amino-benzene-sulfonamide, was first synthesized by Gelmo in 1908. Thereafter investigations as to its uses were confined to the dyeing industry until 1935 when Domagk drew attention to a related compound, sulphonamido-chrysoidine, which had marked antibacterial activity when administered to rats that had been inoculated intraperitoneally with fatal doses of streptococci.

Domagk's findings were that this drug possessed some degree of chemotherapeutic influence in cases of experimental staphylococcus infection but was valueless in cases where the pneumococcus was the infecting organism. Hence the chief interest aroused at the time was its use in streptococcal infection. His experiments were confirmed by a group of French investigators. They concluded that the main action of the drug was in its ability to stimulate the de-

fense mechanism of the body. At this time everyone accepts this view but just how it is brought about has never been proved. These French workers proved that the red dye used by Domagk was broken down at the azo linkage to produce para-amino-benzene-sulfonamide, the compound now known as sulfanilamide.

This momentous work was soon thereafter confirmed by experimental workers in England and in America. Favorable results were reported in cases of puerperal sepsis and its chemotherapeutic properties were found effective in experimental meningococcic infections in mice.

Among the spectacular results obtained by the use of sulfanilamide probably the most successful ones have been obtained in the treatment of streptococcal meningitis. Previously a few favorable results were obtained by drainage of the spinal canal, but they were few and far between.

Case Reports

Case 1. M. J, aged 21, entered the Methodist Hospital from Mesquite, Texas, where there have been periodic outbreaks of meningococcic meningitis for several years. Spinal puncture revealed cloudy fluid containing many gram negative diplococci. He was given 120 grains of sulfanilamide the first 24 hours and thereafter a maintenance dose of 60 grains daily for three days. Meningococci disappeared after the first 24 hours and he was pronounced cured at the end of a week.

Case 2. Miss M. H., aged 24, was admitted to the Methodist Hospital Jan. 5, 1938 with diagnosis of cerebellar tumor. Exploration was done and a large mass was found occupying the right cerebellar fossa. The operation had to be suspended because of severe hemorrhage. The wound was carefully closed and a transfusion was given. One week later she was again operated upon and a large part of the right cerebellar hemisphere was removed. She stood this ordeal nicely but at the end of 48 hours it was very evident that she had meningitis. A spinal puncture revealed a short chain strep, which on culture proved to be a hemolytic streptococcus. She was given 75 grains of sulfanilamide intravenously for three days at which time vomiting had ceased and she could take it by mouth. Convalescence was uneventful afterward.

Credit for the suggestion that specific compounds may be developed which may exhibit specialized activity against certain types of infection, goes to Rosenthal and his coworkers in the National Institute of Health.

In May 1938, another new substance, sulfapyridine, reported by Ewins and Phillips of England, was found to be very effective in pneumococcic infections.

Pneumococcic meningitis had been, previous to this time, a very fatal disease. Personally I had one case to recover following lumbar laminectomy and prolonged catheter drainage. However,

pneumococci were only found at the first puncture which led some to doubt the diagnosis.

I have had one case, in which no bacteria were found by smear or culture, that did not respond to sulfanilamide, but did to sulfapyridine.

CASE 3. D. S. was injured in an automobile accident, Aug. 7, 1940, sustaining a fracture of the skull in the right frontal region. He was unconscious about 24 hours and then complained of blindness. I saw him 13 days later and advised exploration of the optic chiasm. At operation a very large organized epidural blood clot was found and removed. This clot was directly over the anterior pole of the right frontal lobe which was extensively compressed. A hematoma formed in the scalp incision which was opened and drained. He was sent home ten days after operation. The small unhealed area was clean and was kept covered with sterile dressing. About ten days after going home he awoke complaining of headache and vomited soon afterward. I saw him at 2:00 p.m., at which time his temperature was 103 plus—pulse 140 plus and he was in coma. He was hurriedly removed to the hospital, where spinal puncture revealed 7,000 white blood cells per c.m.m. in spinal fluid, but no bacteria were found. Cultures were taken and 60 grains of sulfanilamide were given in 1,000 c.c. of normal saline intravenously.

This was repeated every eight hours and he was given 180 grains of this drug in 24 hours, but the temperature did not drop and his pulse remained very rapid. Coma was profound. No growth had appeared on the inoculated culture mediums. It was decided to try sulfapyridine and he was given 75 grains intravenously daily and in 48 hours his temperature dropped to about 100. The pulse became better and vomiting ceased. Spinal punctures were done every 12 hours and large amounts of cloudy fluid were removed but he remained in coma and he was very rigid. Vomiting had ceased and an indwelling nasal duodenal tube was passed so that he could be fed. It was noticed that he seemed to be stiffer after the spinal punctures and hence it was decided to omit them. Sulfapyridine was given by nasal tube, 15 grains every four hours. He seemed to improve soon after leaving off the spinal punctures and no more were done. Thereafter convalescence was rapid and he was discharged on the twelfth day. His vision is poor but he has regained his normal weight and now seems well.

CASE 4. L. W. B., aged 64, was admitted to the Jones Hospital with a severe mastoiditis, and operation performed shortly afterward. On the second postoperative day, there developed severe headache, vomiting and nuchal rigidity. Sixty grains of sulfanilamide was being given intravenously when I saw him at 11 a.m. Examination revealed profound coma, extreme rigidity of the neck, back and legs. Temperature was 104.5. The pulse was very rapid and cyanosis was very noticeable. Spinal puncture revealed a pressure of 30 mm. of Hg, cloudy fluid, 8,000 cells per c.m.m. and many pneumococci on smear which had the appearance of a type 3. Shortly afterward he was given 75 grains of sulfapyridine intravenously, and this was repeated in twelve hours. An indwelling nasal duodenal tube was passed and he was given eight ounces of fluids every two hours. At the end of 24 hours his temperature was 99 and the pulse was less than 100. Another puncture was done the following day to check the pressure. He was given 15 grains every four hours by tube, day and night for about one week at which time he was conscious, the rigidity

had disappeared and he was able to swallow. The tube was removed and a liberal diet was ordered. Another puncture was done on the tenth day and the fluid found grossly clear. No cells were found. This man came to my office on April 1, 1941 and seemed perfectly well. Neurologic examination revealed normal findings.

In all this, the patient received 1,035 grains of sulfapyridine. The highest blood concentration was 10.2, and the one spinal fluid concentration was 5.

Another case of pneumococcic, type 3, meningitis is under observation at this time. He is being treated with sulfapyridine by nasal tube.

The newest or rather the latest chemotherapeutical agent that has been extensively used is sulfathiazole. It has been reported to be useful in staphylococcus infection. However, the drawback to it in the treatment of meningitis is that it does not pass readily into the spinal fluid.

CASE 5. Miss M. entered the Methodist Hospital Sept. 17, 1940 with severe osteomyelitis of the frontal area originating in the frontal sinus. Smears and cultures revealed Staphylococcus aureus. Radical surgery was undertaken and almost the entire frontal bone was removed. A large epidural abscess was found. The dura was not tense. Drainage was provided. A supply of sulfathiazole was obtained and she was given 15 grains every 4 hours for one week. There was very little wound discharge, but at this time she began to complain of headache, became drowsy and left hemiplegia developed. The spinal fluid remained clear. It was realized that a brain abscess was forming, but an operation at this time would have been inadvisable. Death occurred two days later. No autopsy was obtained.

CASE 6. M. S. McC. was admitted to the Methodist Hospital Jan. 27, 1941, complaining of intense headache, vomiting and convulsions. Temperature was 99.2; pulse 60 and white blood count 16,800.

There was a small sinus in the center of the forehead just below the hairline discharging a small amount of thin pus. He had been struck over the head several times about three weeks previous to his admission, when arrested by a drunken deputy constable. Careful neurologic examination was essentially normal with the exception of spinal fluid pressure of 28 mm. of Hg. There were 47 cells per c.m.m. Cultures and smears from the draining sinus revealed gram positive short-chain streptococci. Headache was very severe, requiring large doses of codein at frequent intervals. Sulfanilamide was given intravenously in 30 grain doses every six hours for two days and then reduced to 15 grains, by mouth, every four hours for another two days when it was discontinued. Ventriculograms were negative.

On February 3, the infected bone in the forehead was removed. The dura was coagulated on each side of the median line and the frontal lobe explored with a canula, but no abscess was found.

He was observed at his home for two weeks when signs of a frontal lobe abscess were more pronounced. He was again admitted to the hospital on March 4. Ventriculograms showed compression of the right anterior horn and displacement to the left. Immediate operation was performed and a well encapsulated abscess was found near the surface of the anterior pole of the right frontal lobe, but about 1 cm. below the bony opening left at the time of the former operation. The frontal bone was rongeured away so that the

abscess was uncovered. The dura was opened radially and a large cannula was passed into the abscess and the pus drained without suction. The cortex was sealed to the dura by coagulation and the roof of the abscess was removed with the electrosurgical loop. The cavity was packed with strips of rubber dam which was not disturbed until it was all extruded.

Cultures from the abscess grew a short pointed bacillus which was examined in the Baylor University Bacteriological Laboratory and pronounced a diphtheroid bacillus.

Following this operation, sulfathiazole was given in 15 grain doses every four hours for 48 hours. The dose was then reduced to 15 grains four times a day.

This dosage was continued throughout his stay in the hospital and with no noticeable discomfort.

He gradually improved and was discharged on March 30, with only slight herniation. The headache had disappeared, he was eating and sleeping well and had been coming to the office for dressing of the wound.

This man may have recovered from the surgery alone, but I believe the sulfathiazole assisted.

Conclusion

The sulfonamide group of compounds are of specific value in infections of the central nervous system.

In meningitis, sulfathiazole is not effective, but is so in infections of the brain proper.

Meningitis due to staphylococcus aureus does not respond to sulfanilamide therapy, but some recoveries have been reported.

DUODENAL DRAINAGE IN THE DIAGNOSIS OF GALLBLADDER DISEASE

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THE determination of the status of the gallbladder in the patient with upper abdominal complaints has too long been a procedure in which chance has frequently played an important role. Lacking methods of precision the diagnostician has been forced to rely on the story of the patient for most of the data necessary to the solution of a most complex problem. Palpation of the abdomen has added little information, for the gallbladder was seldom tender, rarely palpable, and usually no muscular rigidity was to be found. Inspection seldom revealed anything unless there was a complicating jaundice. Other physical methods were usually unrevealing. Available laboratory work was of little value except in cases of icterus or acute inflammation.

Of course it was demonstrated that in acute cholecystitis, the fulminating empyemas, perforation of the gallbladder with peritonitis and in some cases of cholelithiasis no extensive laboratory or x-ray aid was needed to establish an accurate diagnosis. These easily diagnosed conditions, however, made up only a small per cent of the cases which were presented to the average practitioner for his opinion as to necessary treatment. It was the chronic disease which was often obscure and which frequently defied accurate diagnosis. But for the aid of accessory diagnostic procedures, which have been refined and partially popularized in recent years, these cases would continue to be as elusive and mysterious as they were in the past, often terminating in unnecessary and unwarranted operations.

Critical study of the gallbladders removed with the meager data which were previously available acting as the preoperative criteria of disease revealed a high incidence of error in diagnosis. Gross examination of the gallbladder often displayed only an enlarged viscus, possibly thick-walled but certainly no definite changes which could logically be accused of producing the array of symptoms for which surgery was advised. Histologic study of the gallbladder wall would often reveal no evidence of acute or chronic inflammation. Also it was commonly noted by the careful observer that the symptoms of such a patient were not permanently relieved by cholecy-

Read before the Postgraduate Surgical Assembly (the twelfth annual meeting) of The Southeastern Surgical Congress, March 10, 11 and 12, 1941.

stectomy. Some temporary benefit was frequently seen but usually no more than might be expected to result from proper diet, rest in bed and nursing care. When these patients have been carefully followed over a long period of time after cholecystectomy it has been demonstrated that surgery for functional disease of the gallbladder has given no permanent relief of symptoms. In fact the patient was often made worse by his visit to the operating room.

Fortunately the situation changed considerably when Graham and Cole[1] in 1924 secured roentgen visualization of the gallbladder

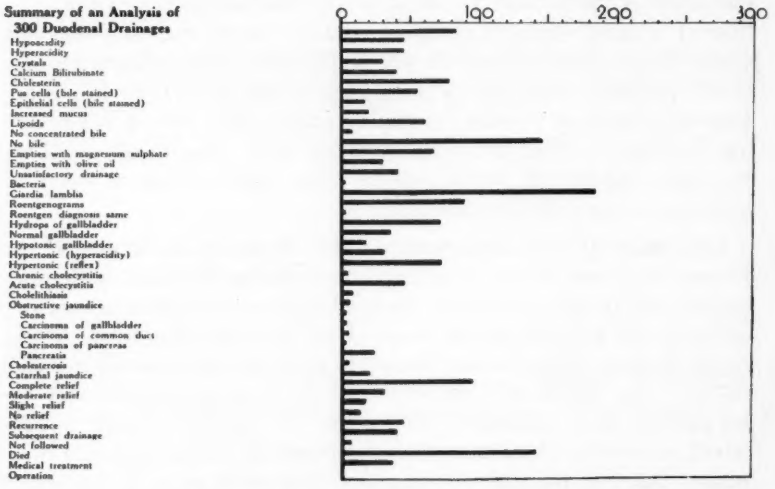
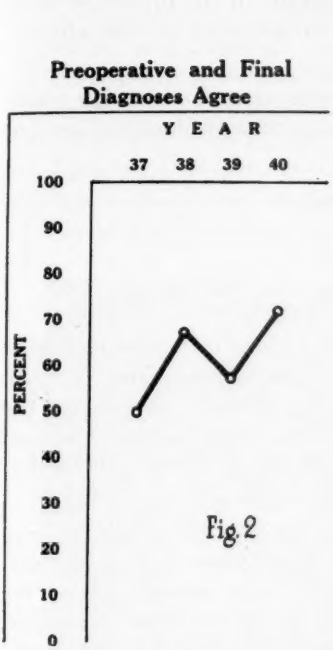
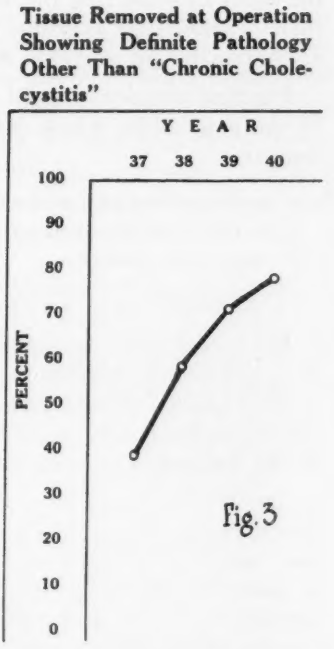


Fig. 1. Duodenal drainage in the diagnosis of gallbladder disease.

by the administration of a halogen compound. But while cholecystography was a marked advance in diagnostic procedure it did not seem to give all the data that were necessary to make a satisfactory differentiation between medical and surgical disease of the gallbladder or give all the information which would properly classify the medical cases. After a period of critical trial in widely separated centers, diagnostic duodenal drainage has emerged as a practical valuable adjunct in the study of disorders of the biliary tract; ranking almost with cholecystography, and supplying some additional facts which were needed to make the diagnostic picture more accurate.

Introduced by Henmeter[2] in 1896 and popularized by Lyon[3] in 1919 under the title of "non-surgical biliary drainage" duodenal intubation gained temporary favor, then was practically discarded by the profession. Recently there has been a renewed interest in it,





Figs. 2 and 3. Duodenal drainage in the diagnosis of gallbladder disease.

but as a *diagnostic* procedure instead of therapeutic. This has been largely due to the work of Carter[4] and his associates who have demonstrated its value especially in differentiating between the various types of functional gallbladder disease. An informal survey of the routines of a number of hospitals in various parts of the country has given the impression that drainage is not widely used, although some clinics have reported on several thousand such studies and are enthusiastic about the results. Unfortunately a few writers have condemned the procedure without first having had adequate experience with it.

Diagnostic drainage can be carried out by any qualified technician in either a hospital or office laboratory, but examination of sediment must be carefully performed if maximal information is to be gained. Interpretation should be done by a physician who is familiar with the physiology of the gallbladder and the mechanism of disturbances of function which may occur in that organ. The discouraging results which have been reported are probably due to lack of care in technic or failure of the physician to equip himself for interpretation. The information to be gained by drainage is adequate compensation for

the effort of mastering the necessary details of the procedure since there is knowledge available by study of the duodenal bile which is not obtainable by any other method.

Practical questions regarding the functional and pathologic status of the gallbladder which may be answered with duodenal intubation are:

1. Is the gallbladder functioning normally?
2. Is the gallbladder inflammed?
3. Are stones present?

Functional Disease

By far the most important group of facts to be derived from drainage is that relative to the mechanism which causes the gallbladder to fill with bile, concentrate bile and discharge bile into the intestine when it is needed. To explain this it may be well to review briefly the present conception of the physiology of the gallbladder.

The liver secretes bile continuously. The sphincter of Oddi is closed except when chyme enters the duodenum. While the common duct sphincter is closed, the bile which flows down the hepatic ducts is shunted into the gallbladder. There it is stored and, by the absorption of fluid and salts, it attains four to ten times its original concentration. When acid chyme enters the duodenum from the stomach, the sphincter of Oddi opens allowing bile to flow into the duodenum. The fat in the partly digested food stimulates the formation of cholecystokinin in the duodenum which in turn causes contraction and emptying of the gallbladder. Various forces come into play in this complex mechanism. It is not difficult to imagine that a number of conditions might occur which would tend to upset this normal procedure and thus adversely influence the filling, storing, concentrating or emptying of this small viscus. That is precisely what happens in a large percentage of gallbladders which are giving symptoms, these disturbances in the motor mechanism of the sphincter of Oddi or the gallbladder itself being responsible for the production of symptoms which are often identical with those of organic disease.

At the present time duodenal drainage is the most practical method of differentiating between the various types of dysfunction of the gallbladder. As treatment of the malfunctioning gallbladder cannot be effectively applied unless the type of dysfunction is known, it will be seen that drainage becomes a very important diagnostic procedure. With the Rehfuss or Twiss tube in the duodenum, magnesium sulphate solution or olive oil can be injected and the motile response of the gallbladder noted. If the gallbladder empties

with magnesium sulphate, it is apparent that treatment with this substance, and other therapeutic agents which tend to relax the sphincter of Oddi, is indicated. If, on the other hand, there is no response to magnesium sulphate and there is a good response to olive oil, it is at once seen that a high fat diet with the addition of digestible oils is the treatment which should be used. Without this information which drainage gives, treatment becomes empirical and good results cannot be expected to occur uniformly.

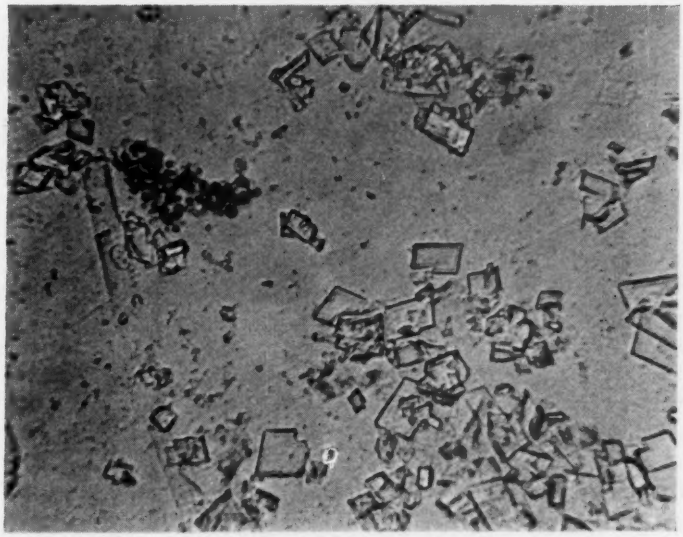


Fig. 4. Typical cholesterin crystals and clump of calcium bilirubin pigment, granular type. Magnification 700X.

In the light of present day knowledge, we are forced to recognize the existence of various types of functional gallbladder disease, and should refuse surgery on the gallbladder except when definite organic disease has been proved. Likewise we are forced to abandon the idea that if the patient does not respond to medical treatment then operation must be done. Rather the case should be re-evaluated and an adjustment made in medical therapy if any change is found in the motor response of the gallbladder.

An effort should be made to recognize those cases of calculous disease of the gallbladder which are associated with stasis. This information will aid in the institution of more specific medical therapy after operation and help prevent a recurrence of symptoms.

Calculi

Some investigators consider that the diagnosis of stones by duodenal drainage is as positive as by radiography. Other observers think that it has limited value. In our series we found that 60 per cent of patients showing calcium bilirubin pigment in the biliary drainage were later proved to have stones; 56 per cent of those showing cholesterol crystals were found to have stones; and 89 per cent of those showing calcium bilirubinate and cholesterol crystals together in the sediment were definitely proved to have calculi.

Fig. 5. Field practically filled with amorphous calcium bilirubin pigment, common form. Magnification 700X.

Nineteen per cent of those with proved calculi showed no crystals in the drainage. It is to be inferred from this study that crystalline sediment is to be considered only as presumptive evidence of stones.

A positive culture of the colon bacillus and the finding of calcium bilirubin pigment is very strong evidence of common duct stone; thus the finding of these bacilli in the same specimen with brilliant golden calcium bilirubinate may become an important factor in making a decision to explore the common bile duct.

Besides the information which drainage supplies in regard to function, stones and inflammation of the gallbladder it occasionally gives the following:

1. Evidence of obstruction of the common duct when no bile is obtained after repeated stimulation by magnesium sulphate and olive oil.

2. Evidence of obstruction of the cystic duct when only light bile in limited amounts is procured.

3. Evidence of cholangitis when bile-stained pus cells are found in the third specimen of bile.

4. Evidence of duodenal disease by the finding of red blood cells or pus cells which are not bile stained in the biliary sediment.

5. Evidence for or against stone, infection or obstruction of the common duct in cholecystectomized patients. A complete study of the duodenal bile will often give the required information and frequently save the patient another major operation.

A gastric analysis may be combined with duodeno-biliary drainage so that data relative to the degree of gastric acidity are obtained. This has been found to be of importance in identifying the different types of functional disease of the gallbladder.

Evidence is accumulating in our laboratory which tends to show that duodenal drainage may prove of value in the diagnosis of cholesterosis of the gallbladder. In this condition some of the lipoid deposits which are found on the mucosa are also free in the bile, and can be demonstrated in the centrifuged sediment under the polarizing microscope.

Three hundred duodenal drainages on 259 patients have been done in our clinic during the past five years. All of these patients had symptoms which could be attributed to disease of the gallbladder, such as right upper quadrant colic, or dull pain, distress after food, intolerance to fats, eructation of gas, indigestion, nausea and jaundice. As a rule there were few physical findings, at times none; sometimes tenderness in the right upper quadrant, a mass in the gallbladder region or icterus. The routine laboratory procedures for the most part gave negative results. Diagnosis was made almost entirely from radiography and the findings of a duodenal drainage. Cholecystograms were made by the double dose method, 36 hour technic, or by intravenous administration of the dye. Drainage was done either following the first satisfactory roentgenogram, in which case it took the place of a fat meal, or was done the next morning.

This study shows that 67 of the 259 gallbladders were normal, 60 showed functional disease only, totalling 127 which were definitely proved to be non-surgical. Fifty-six cases were diagnosed as chronic cholecystitis without stones. These were all mild cases, most of them were associated with stasis and were therefore considered as amenable to medical treatment. We feel that many of these patients would have been advised to have operation had it not been for the findings of duodenal drainage. The most important point brought out in this study was that only 71 or 27 per cent of these patients were considered to have definite surgical disease.

A review of our operative cases shows that a steadily increasing percentage of gallbladders which have been removed have definite

organic disease as reported by the pathologist. This reflects the attitude of the group in dealing with chronic cholecystitis in a more conservative manner. It is an outgrowth of a follow-up of cases of chronic cholecystitis treated by surgery, which study showed that most of these cases had a recurrence of symptoms. Diagnostic errors have decreased as shown in the accompanying graph.

It is emphasized that duodenal drainage does not replace other methods of study in the evaluation of disease of the gallbladder.

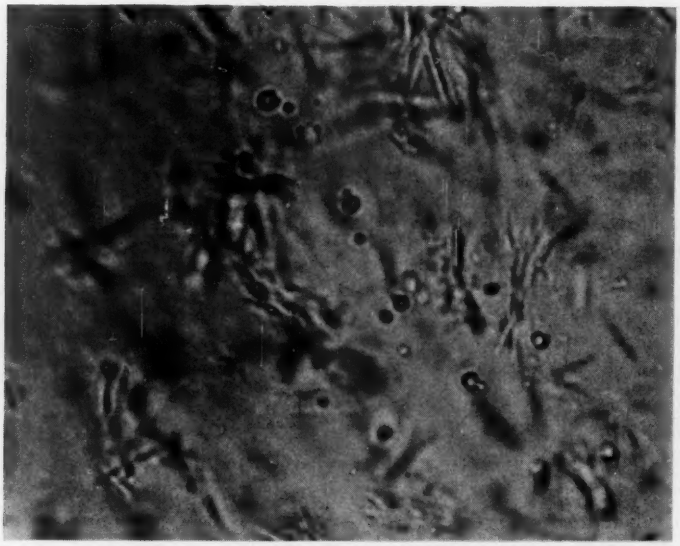


Fig. 6. Doubly refracting lipoid in bile sediment. Appearance in ordinary microscopic observation. Needle-like crystals are magnesium sulphate. Magnification 700X.

It is only a supplement to the other procedures, but certainly one which was badly needed to give a more accurate portrayal of the pathology and disturbed physiology which occur in the biliary tract.

I hope that this paper will not be construed as meaning that gallbladder operations should not be done. Operation is definitely indicated in most cases of calculi, well defined inflammation, obstructive jaundice of certain types, operable neoplasms and perforation of the gallbladder. Duodenal drainage will help to make most of these diagnoses, when additional aid is needed, and will often assist the surgeon in determining when operation is becoming imperative. It will also help the surgeon, as has been pointed out, to avoid operation when no organic disease is present.

The gallbladder is a useful organ and its preservation is worth much time and effort on the part of the physician. In sacrificing the gallbladder unnecessarily the patient loses not only time, money and the integrity of his abdominal wall but also parts with an organ which is essential to the normal digestion of an ordinary diet. As stated by Carter, Greene and Twiss,[4] the common duct may take over some of the functions of the gallbadder by dilating and even altering its mucosa so that it will concentrate bile to a certain extent,

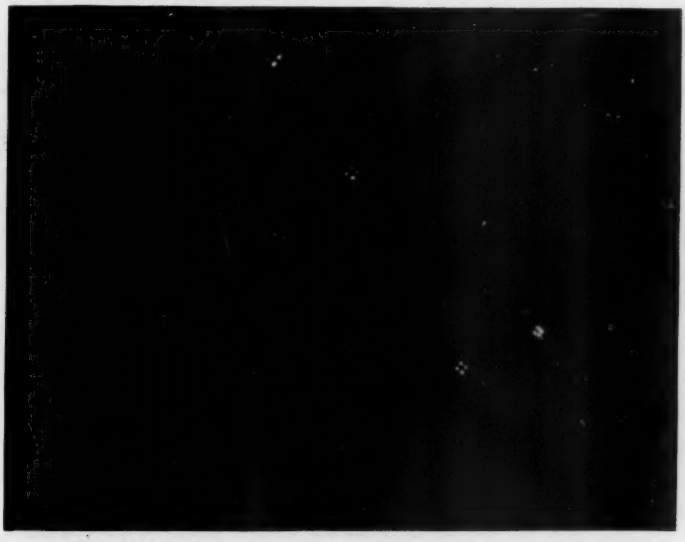


Fig. 7. Same lipoids as in fig. 6. This photomicrograph shows the typical "Maltese" crosses as seen through a polarizing microscope.

yet it can never assume the expansile or elastic role of the gallbladder in helping stabilize the intraductal bile pressure.

Time, with patient and painstaking investigation, will bring further refinement and new procedures to the present methods of study of the biliary system. But even now we have at our command diagnostic possibilities which, if properly used, will eliminate most of the unknown regarding upper abdominal and digestive complaints and give an accurate picture of the existing condition without the necessity of exploration. The added knowledge which these precise methods have brought gives confidence to the surgeon since it takes away some of the mystical which has too frequently accompanied the complexity of symptoms and lack of physical signs which so characterize the patient with gallbladder disease.

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INDICATIONS FOR SURGERY IN DUODENAL ULCER

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INTRODUCTION

The purpose of this paper is the reconsideration of certain indications for surgery in duodenal ulcer and the presentation of a series of cases operated upon at Parkland Hospital, Dallas, Texas, by members of the surgical staff; from 1935 through 1940.

IF duodenal ulcer is not a local disease but a local expression of a constitutional disturbance, then we must agree that operation offers little to the patient who suffers from an uncomplicated duodenal ulcer. Therefore, the advisability of operations in the presence of a duodenal ulcer must depend upon the fact that proper medical management has failed to control the disease and that certain definite complications have arisen. The conservative trend in the management of ulcer is indicated by Crile's figures which show that whereas in 1922, 35 per cent of patients with ulcer at the Cleveland Clinic were operated upon, in 1937 only 5 per cent of ulcer cases were treated by surgical methods.

When an ulcer does not heal, one of several complications may occur. First, perforation. Second, hemorrhage, and we mean gross hemorrhage. Third, stenosis at the pylorus interfering with normal gastric emptying; and finally, there may be such intractable pain that the patient is rendered unable to carry on a gainful occupation.

The relative frequency with which complications of ulcer occur is indicated by Portis and Jaffe in 9,000 consecutive necropsies at the Cook County Hospital who found 118 cases wherein the ulcer was the essential lesion. In those cases in which the peptic ulcer was the essential lesion, perforations were present in 20 per cent. Hemorrhage was present in 18.3 per cent and stenosis was present in 7.5 per cent. They also discovered that hemorrhage was more frequent in the stomach and that perforation was more frequent in the duodenum. They report also from the predominance of scar that gastric ulcer tends to be acute while duodenal ulcer tends to be chronic.

Pursuing the same thought in the matter of the relative frequency of complications, Monroe and Emery in 87 fatal cases of ulcer at the Peter Bent Brigham Hospital reported that perforation was the cause of death in 32 per cent, hemorrhage 27 per cent, obstruction 11.5 per cent. They found that more patients ultimately died of their ulcer after surgical than after medical treatment. They admitted, however, that this might be due to the severity of the cases which were treated by surgical means.

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Perforation, then, is the most common surgical complication of duodenal ulcer, and in 2,600 cases reported from the New Orleans Charity Hospital by Odom and De Bakey the frequency was found to be seven times greater in the past 10 years. The mortality rate in cases of perforation varies considerably in series of cases reported by various authors. Thompson reviews 500 acute perforations with a gross mortality of approximately 40 per cent. Contrasted with the figures of Thompson are those of Ross and Letourneau reporting from the Montreal General Hospital who find a gross mortality of 17 per cent in 220 cases of acute perforation. Surprisingly, these authors report a lower mortality in this series of unselected cases when closure with posterior gastroenterostomy was done than when simple closure alone was done. They state further that no postoperative deaths were attributable to a brokendown gastroenterostomy wound and that complications were no more frequent following gastroenterostomy than following simple closure. There are many other American and European authors, notably Finsterer, who advocate some form of corrective surgery in the presence of early acute perforations, although the majority of American writers hold that simple closure is all that should be done.

The question is asked: Do perforating ulcers remain cured following operation? The answer to this is given by Thompson who states that in approximately 40 per cent, continuation or resumption of treatment is required within 5 years, that in 10 per cent the treatment will be necessarily surgical.

Bacteriologic studies of the peritoneal fluid in perforated ulcers was made by Davison reporting 76 cases at the Cook County Hospital in 1937. He finds that cultures in the first 6 hours are generally sterile. When a positive culture is found within the 6 hour period the mortality is higher and the most common organisms are the colon bacillus and the streptococcus. Their presence, he states, is related clinically to complications and is directly responsible for the higher mortality and morbidity.

The bleeding ulcer presents a much more difficult problem than does the perforating ulcer, and the indications for operation in the former cannot be so dogmatically stated. Difference of opinion exists not only as to when to operate and what to do at operation in cases of hemorrhage, but even whether operation is indicated at all. The diversity of opinion in the treatment of the bleeding ulcer is evident when we stop to examine the papers of Goldman, Hinton, Hurst, Graham, Finsterer, Taylor, Gordon, Allen and others.

In this connection, it is interesting to compare the frequency of

TABLE 1

Indications for Surgery in Duodenal Ulcer: 85 Cases

Parkland Hospital—Dallas, Texas

Cases:	Perforation 67:78%	Obstruction 8:9.4%	Bleeding 5:5.9%	Pain or intractibility 5:5.9%
Deaths:	Total: 11 Surgical: 7 Non-surgical: 4	1	0	1

Total cases of Peptic Ulcer Admitted to Hospital, 1935-1940: 320

SURGERY EXCLUDING PERFORATIONS: 18 CASES

	Obstruction	*Bleeding*	*Pain or intractibility*
Cases:	8	5	5
Type of Operation:	Resection: 3	5	3
	Gastro-enterostomy: 5	0	2
Results:	Deaths: 1	0	1
	Leakage of stump-closure—peritonitis	1 postoperative hemorrhage	Attempted closure of fistula at stump.

massive hemorrhage from peptic ulcer with that of massive hemorrhage from other causes in the upper gastrointestinal tract. Collins and Knowlton reviewed 141 cases of massive hemorrhage and they found 71 per cent to be due to peptic ulcer, 7 per cent to carcinoma, making a total of 78 per cent as an incidence of intrinsic diseases of the stomach and duodenum responsible for massive hemorrhage. Extrinsic factors were the cause of the hemorrhage in 22 per cent. They found splenic anemia of the Banti's type to be 13 per cent and cirrhosis to be 9 per cent in the cause of massive hemorrhage.

In 1,800 cases of ulcer reported by Allen and Benedict from the Massachusetts General Hospital, bleeding sufficiently severe to be recognized grossly was present in 200 and of this number, the hemorrhage was of sufficient quantity to be classified as massive in about 45 or 22 per cent. They found the mortality to be approximately 14 per cent in those cases of massive bleeding.

Significantly, they report a much higher mortality rate in the elder class of patients than in the younger groups, for in 90 of their patients below the age of 50 who bled grossly, 4 died of hemorrhage, while of 43 patients above 50 who bled grossly, 14 or practically one-third died from hemorrhage.

Hinton found that 18 per cent of his 135 cases with massive hemorrhage had a negative gastric history and he reports a mor-

TABLE 2

Surgery for Perforation—67 Cases

Time in Hours	No. of Cases	Pneumo-peritoneum	Operation	Results	Previous History
0-6 hours	26	Present — 12 Absent — 10 No film — 4	Simple Closure 25 Not operated (1), recovery Drained—3 Not drained 22	Uneventful 16 Wound infection or disruption 3 Respiratory Complications 3 Residual Abscess 2 (drained)*	Present 24 Absent 2
	DEATHS—2 1. Progressive jaundice & broncho-pneumonia (not drained)* 2. Subdiaphragmatic abscess peritonitis (not drained)* Mortality: 7.6%				
7-12 hours	28	Present — 17 Absent — 9 No film — 2	Simple Closure 26 Excision 1 Not operated 1	Uneventful 14 Wound infection or disruption 8 Respiratory Complications 3 Residual Abscess 1 (?)	Present 25 Absent 2 Not Recorded 1
	DEATHS—3 1. Gen. peritonitis—drained 2. Gen. peritonitis—not drained 3. Not operated—Gen. peritonitis Mortality: Gross: 10%; Surgical: 7%				

*At time of operation.

tality rate of about 12 per cent under conservative medical management. Pfeiffer of Philadelphia reporting 62 patients with gross hemorrhage from ulcer found a mortality rate of 7.5 per cent in those cases treated medically and a mortality of 22.7 per cent in those cases treated surgically.

Balfour also found the mortality rate in cases of hemorrhage treated conservatively to be less than the mortality of hemorrhage plus surgical treatment.

On the basis of the figures of Allen and Benedict, it is apparent that single massive hemorrhages in patients under 50 rarely cause death. Furthermore, the fact that a young ulcer patient has had one massive hemorrhage does not necessarily presuppose that subsequent hemorrhages will occur. Thus, operation during or for the purpose of preventing hemorrhage is probably not justified in young individuals. Recurrent massive hemorrhage, however, in young individuals is sufficient indication for surgical treatment for

TABLE 3

Surgery for Perforation

Time in Hours	No. of Cases	Pneumo-peritoneum	Operation	Results	Previous History
13-24 hours	8	Present — 2 Absent — 3 No film — 3	Simple closure 5 Drained 6 Not drained 1	Uneventful—2 Wound infection or disruption 2 Respiratory complications 0 Residual abscess 1 (?)	Present 2 Absent 6
	DEATHS: 3 1. Gen. peritonitis 2. Gen. peritonitis (not operated) 3. Perforation into pancreas and pancreatitis—not closed. Mortality: Gross: 37% Operative: 25%				
Over 24 hrs.	5	Present — 5	Simple closure 1 Drainage only—Pelvis 1 Not drained 1 Not operated 3	Uneventful 1 (not operated) Residual abscess—3	Present 5
	DEATHS: 3 1. Gen. peritonitis (not operated) 2. Gen. peritonitis (not operated) 3. Gen. peritonitis (following drainage pelvic abscess) Mortality: Gross: 60% Surgical: 40%				

the reason that repeated hemorrhage in a patient on an adequate medical program is evidence that the ulcer not only refuses to heal but that it may be progressive in its course. Crile reports that only about 15 per cent of ulcer patients who have recurrent massive hemorrhages will remain well under a conservative management. In this regard Means states his policy is to advise operations in the older patients with active and severe hemorrhage who after 12 to 24 hours under proper medical management including transfusions, etc., show no clinical improvement.

Hunt summarizes his treatment of bleeding ulcers as follows: In patients under 50 years of age repetition of massive hemorrhage is an indication for surgical treatment, and in patients in that age group operation is seldom if ever indicated during the hemorrhage. In patients above 50 who have recovered from one single massive hemorrhage through the employment of non-surgical means, operation should be advised and if a patient above 50 who is bleeding

shows no improvement within 12 to 24 hours, immediate surgical exploration is to be undertaken during the hemorrhage.

In considering the type of surgery to be performed in the treatment of massive hemorrhage from duodenal ulceration, Graham states that dogmatism is out of place because too many factors are involved. He suggests that if the ideas of Finsterer of Vienna were generally adopted, namely operation in all cases of severe hemorrhage within 24 to 48 hours, disastrous results might follow. Yet, Finsterer reports surprisingly good results and advocates resection wherever possible in active massive hemorrhage. Graham suggests that it might be better to follow the technic of Michael J. Smyth and Frank D'Abreau of London who recommend simple transduodenal or rather transpyloric plication or suturing of the bleeding points with closure of the duodenum and pylorus transversely. This results virtually in the performance of a pyloroplasty in addition to securing hemostosis.

In the matter of obstruction at the pylorus as a complication of duodenal ulcer, the problem of differentiating between obstruction due to scar and that due to edema accompanying inflammatory reaction must be solved. The necessity of such a differentiation is apparent when we reflect that an operation as for instance gastroenterostomy which will give brilliant results in the first condition, will result in failure many times if applied to the second. The improper application of gastroenterostomy has no doubt contributed in a large measure to the decreasing popularity of this procedure in the treatment of ulcers of the duodenum. The appearance of obstruction along with active ulcer symptoms should make us suspicious that the obstruction is not permanent in character and should lead us to adopt a more conservative attitude which in many cases will be followed by gratifying results.

The choice of operation in the case of the obstructing duodenal ulcer must necessarily depend to a large degree upon the acidity of the gastric contents. In the case where there is a low or absent free hydrochloric acid, the simple short-circuiting procedure of gastroenterostomy will usually be quite satisfactory, but in the presence of high acid content it is probably safer as far as future complications are concerned to proceed with a more radical operation at the outset. Harper agrees that gastroenterostomy should be reserved for the patients older in years if their gastric secretion shows low or absent hydrochloric acid and if their retention is proved to be due to definite cicatrization rather than to inflammation or edema.

Intractable pain, when it interferes with the normal daily activities, is sometimes considered an indication for operation in ulcers

otherwise uncomplicated. It is true that operations undertaken solely for the relief of persistent pain are followed by less satisfactory results than those undertaken for the relief of some of the other complications of ulcer. Crile has found that slightly more than half of the patients operated upon purely for the relief of pain obtain the relief sought for, and that many of these patients so relieved find it necessary to remain on a guarded diet in order to avoid recurrence of symptoms.

Conclusions

The uncomplicated duodenal ulcer is a medical problem. Surgical treatment should be undertaken only in the presence of certain local complications which may have arisen as the result of the local ulceration. The complications which indicate the need for surgery are in the order of their frequency: First, perforation; second, recurrent hemorrhage in patients below the age of 50 or single massive hemorrhages in patients above 50; third, proven pyloric stenosis as the result of scar formation; and finally, intractable pain in ulcers otherwise uncomplicated which have received adequate medical treatment.

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CANCER OF THE LARYNX, DIAGNOSIS, TREATMENT AND RESULTS

With Observations on the Relation of Benign Tumors to Cancer

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CANCER of the larynx should be of very great interest to the general practitioner. He should be familiar with the fact that in at least 75 per cent of the cases cure can be obtained if early diagnosis is made and the proper treatment applied. Cancer of the larynx is relatively frequent in occurrence, and no less an authority than Sir St. Clair Thomson states that the disease is increasing in frequency. The cause of the disease is unknown. The known etiologic factors are generally the same as in other organs. Chronic irritation and functional trauma are definite etiologic factors in the development of laryngeal cancer. Vocal abuse, tobacco and alcohol are definite sources of irritation. The use of the larynx during an acute inflammatory reaction and edema of the mucous membrane develops masses of thickened tissue on the vocal cords (inflammatory tumors), and these become the source of chronic irritation and have been definitely shown to precede the development of cancer in many patients.

Site of the Primary Lesion: Statistics vary regarding the relative frequency of intrinsic and extrinsic cancer. The cases in my own series show a very high rate of primary involvement of the true vocal cords, the majority of the cases occurring in the same location where we find inflammatory tumors are so prone to develop. In a study of 200 consecutive cases previously reported, the cancer originated intrinsically in 77 per cent. However, in many cases when seen the growth had extended outside the larynx, and in some instances the glands in the neck were involved. The statistics as given from the tumor clinics indicate that the lesion is very extensive and of long duration in the cases that they observe. This is probably due to the fact that the patients go to the tumor clinics because they have "lumps in their throat." In order to cure cancer of the larynx, the diagnosis must be made before metastatic extension to glands appears.

Statistical studies from many large groups of reported cases prove that (1) cancer of the larynx is curable in from 75 to 80 per

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Read before the Postgraduate Surgical Assembly, the twelfth annual meeting, of The Southeastern Surgical Congress, Richmond, March 10, 11 and 12, 1941.

cent of the cases when the diagnosis has been made in the early stages of the growth. (2) That the early symptoms of cancer of the larynx are hoarseness and local discomfort.

Symptoms: Hoarseness and local discomfort are the early symptoms of both benign and malignant tumors of the larynx. Hoarseness occurs earliest in cancer of the vocal cords or vocal area of the larynx. Local discomfort occurs first in the silent or extrinsic portion of the larynx, but as the lesion progresses, hoarseness may occur from interference with laryngeal function. The symptoms come on gradually and are progressive. There is slight discomfort, a feeling of something abnormal, a sticking or pulling sensation, but as the lesion increases, the symptoms become more definite; dysphagia and referred pain may be present.

As a corollary to these symptoms, a patient presenting either hoarseness or local discomfort should be labeled cancer by the attending physician until he is proven to be free of cancer by appropriate studies. There are many causes of hoarseness and local discomfort. Only a small percentage of patients presenting these symptoms have cancer, but the physician has no right to let the patient lose the chance for cure by a mistaken or a delayed diagnosis. An accurate diagnosis can be made in the majority of cases without alarming the patient. Continued observation and repeated biopsy may be necessary.

Diagnosis: In a suspected case of cancer of the larynx the diagnostic steps should be (1) history, (2) careful mirror study with careful palpation of the front of the neck and the region of the larynx and hyoid bone for evidence of extension or glandular involvement, (3) x-ray study of the neck and swallowing function, including special film study of the larynx, (4) general physical examination, (5) blood studies, complete blood counts, Wassermann, and so forth, (6) surgical biopsy. Direct laryngoscopic biopsy is an accurate method of examination and should not inflict undue trauma. Remember that cancer, syphilis and tuberculosis may involve the larynx singly, any two or all three at the same time. Biopsy will show the type of histologic structure of the lesion, and is very valuable in deciding the proper treatment for the individual case.

Prognosis: The chance for cure of early cancer within the larynx is excellent. Where the cords only are involved to a limited degree, 80 to 85 per cent of the cases can be cured by laryngofissure. Where the involvement is more extensive but still within the larynx without evidence of external extension or metastasis, laryngectomy will cure

60 to 80 per cent of the cases in this group. In extrinsic lesions and those that originate within the larynx with extension to the glands and neck structures, the prognosis is unfavorable.

In all cases where there is a reasonable chance for cure the surest method of securing the cooperation of the patient is to tell him frankly the true nature. He will then cooperate in the close follow-up observation that is necessary for at least a three year period following surgery or irradiation treatment of laryngeal cancer to obtain the best results. Where the prognosis is hopeless, there is nothing to be gained by telling the patient that he has cancer. It is most important to secure close follow-up observation in operative cases. Over 90 per cent of the recurrences and glandular involvement will occur during the first year of the postoperative period.

After the diagnosis of cancer is established, two facts should be determined in order to decide the proper method of treatment.

1. The first consideration is the location and extent of the lesion. Intrinsic lesions, those within the glottic or vocal area, true cords or subglottic larynx, are most favorable for surgical treatment. Extrinsic lesions involving the ventricular bands, the laryngeal surface of the epiglottis, the vestibule of the larynx within the aryepiglottic fold, the posterior commissure of the larynx are best treated by surgery. Other extrinsic lesions on the outside of the larynx are best treated by irradiation.

2. The second consideration should be the histologic grading of the biopsy specimen of the tumor by Broders' or other classification. This is a most valuable guide to possible metastatic extension and the suitability of the individual case for irradiation treatment. In early intrinsic cases where the tumor at operation is shown to be a grade 3 or 4 by the Broders classification, the employment of postoperative irradiation as a prophylactic against recurrence should be considered.

Treatment

There are two accepted methods of treating cancer of the larynx.

1. *Surgery.* The surgical extirpation of the cancer-bearing area by thyrotomy or laryngofissure is the procedure of choice in limited anterior intrinsic growths. Total laryngectomy should be employed for intrinsic lesions that are too extensive for removal by laryngofissure and in cases where the lesion extends to the posterior commissure of the larynx. There is a group of lesions also classed as extrinsic, involvement within the vestibule of the larynx, the ventricular bands, the under surface of the epiglottis extending

downward to the ventricular bands, which may be successfully treated by removal of the larynx if excision is made well beyond the limit of the extent of the growth. Partial laryngectomy by the laryngofissure approach of Thomson with removal of the thyroid cartilage on the affected side may also be used under certain conditions. For small lesions, grade 1 or 2 on the laryngeal surface of the epiglottis, the author has performed an excision of the epiglottis by the laryngofissure route with cure in two cases.

2. *Irradiation.* Extensive carcinoma of undifferentiated types, 3 or 4 of Broders' classification, respond well to irradiation therapy. The use of qualitative irradiation as suggested by Coutard apparently produces the best results with the least discomfort to the patient. All cases unsuitable for surgery should have irradiation therapy, although in many cases it will prove to be only palliative. Extensive extrinsic lesions of the pharyngeal surface of the larynx may respond well to irradiation therapy. Early lesions, without any evidence of adenopathy or glandular metastasis, may be treated by pharyngotomy, lateral or transhyoid. Orton reports many successful operations by this method. Many laryngologists, however, recommend the use of irradiation therapy for cancer in this location. Combinations of surgery and deep x-ray or radium therapy have also been successful, producing cure in a considerable number of cases.

There are a number of roentgenologists who have advocated irradiation therapy for all types of laryngeal cancer, including the early intrinsic group. From my own experience I do not believe that cancer that can be cured by surgery should be referred for roentgen therapy. Temporary disappearance of the growth in intrinsic lesions may occur after irradiation, and later recurrence with extension which irradiation will not control, and the death of the patient from cancer will result. There have been many authentic reports of large groups of cases of early intrinsic cancer with permanent cure from laryngofissure and total laryngoectomy. In my own practice every case of cancer of the larynx is seen both by the laryngologist and the roentgenologist. The contribution of the roentgenologist to the diagnosis and determination of the location and extent of the lesion is most important to the laryngologist. The roentgenologist and the patient as well, on the other hand, will certainly come to grief if he attempts to treat and diagnose cancer of the larynx without the aid of the laryngologist. The best interests of the patient demand a close cooperation of the laryngologist and the roentgenologist in the diagnosis and treatment of laryngeal cancer. In many cases it is necessary to supplement surgical treatment by irradiation. The laryngeal surgeon is in the best position to determine whether

or not the patient should have surgery and irradiation, irradiation alone or surgery alone. I am sure that every laryngeal surgeon would be very glad, indeed, if he could refer all the cases of cancer of the larynx to the radiologist for treatment if he knew the radiologist could cure the patient.

Surgical Treatment

Operative procedures: The basic principle involved in the surgical treatment of cancer of the larynx is the same as the surgical treatment of cancer in any portion of the body. Radical excision should be carried out as far as it is required to effect a cure and prevent recurrence of the disease. At the same time an effort is made to preserve all of the normal structure that can possibly be spared. It has been proven by the wide experience of many surgeons that cancer occurring in the anterior portion of the cord can be excised by laryngofissure with permanent cure in from 80 to 85 per cent of the patients.

Laryngofissure: The technic followed in this series of cases has been after the Jackson or Thomson methods as to basic procedure. Some modification of details were developed to meet the varying indications in individual cases. Local anesthesia was used, and the cartilages preserved when possible. The disability of the patient is from two to four weeks at which time the laryngeal function returns and the patient develops a good voice with freedom from recurrence as indicated.

Partial Laryngectomy: I prefer the term partial laryngectomy to hemi-laryngectomy. Half of the larynx is never removed in the procedure and the term hemi-laryngectomy would be incorrect. I have used partial laryngectomy to include the surgical excision where it is extended more widely than a laryngofissure. For example, excision of the epiglottis through the thyrohyoid route, or excision of a wing of the thyroid cartilage with the soft tissues which overlie internally, including also the greater portion of the arytenoid on the involved side, would be a partial laryngectomy. The approach is the same as that recommended by Thomson for thyrotomy. The wing of the thyroid on the affected side is excised giving free access to the interior of the larynx. Tracheotomy is also done and the larynx packed with a "bird's nest" iodoform pack which maintains temporarily a laryngostomy opening. The pack is changed daily and removed permanently in three or four days. If irradiation within the larynx is desired, temporary laryngostomy may be used for its application by the insertion of a radium capsule

into the larynx. The tracheotomy tube is allowed to remain in position for about a week until the airway is well open.

Laryngectomy: Total laryngectomy was the first surgical procedure to cure cancer of the larynx. For many years it was done on many patients who might have been cured by laryngofissure had the technic of laryngofissure been perfected at that time. During the past decade many modifications of technic have been made, so much so that at the present time the surgeon who is doing laryngectomies will modify his technic to suit his own ideas, based, of course, on the technics of his predecessors and contemporaries. There seem to be two general trends in laryngectomy at the present time. These may be described as radical and conservative groups. The radical group removes widely everything attached to the larynx from the internal borders of the carotid sheaths on either side downward to the severed end of the trachea, including the hyoid bone. Only the skin and mucous membrane of the pharynx remain to form the anterior pharyngeal wall below the base of the tongue and the attachment of the tracheal stump to the skin. The reason for the wide excision is that possible metastatic and glandular extensions will be removed. The conservative group of laryngeal surgeons, in cases where there is no evidence of invasion of the cartilage, have been content with the removal of the larynx only. They have left the external perichondrium of the thyroid and cricoid cartilages and have enucleated the larynx and epiglottis from its perichondrial bed. If evidence of metastasis appears later the glands are excised and irradiation used, or irradiation alone is used. It is believed that as good results will be obtained by removing only the larynx and using postoperative irradiation or subsequent excision of metastatic glands, should they appear, as would have been obtained by the preliminary extensive excision. The risk to the patient from postoperative complications, formation of fistula and so forth are much less in the latter type of operation than in the former. Among those who have used the latter type of procedure are McCready of Pittsburgh, Looper of Baltimore and Crowe and Broyles of Baltimore. During the past two and a half years I have used this principle in technic in operative procedures which I have previously demonstrated and described as "subperichondrial extirpation of the larynx." Results to date have been very satisfactory.

Vocal Results After Laryngofissure, Partial Laryngectomy and Total Laryngectomy

The quality of voice developed after laryngofissure depends on the amount of tissue removed from the larynx. If the arytenoid is

not disturbed in the excision, the function of the cords is good. Even in the wide excision of partial laryngectomy the patient usually acquires a useful voice. Some vibrating structure will develop. It may be a fold from the under surface of the epiglottis, the ventricular bands or a portion of the arytenoids.

After laryngectomy a very large percentage of the patients develop an esophageal voice, particularly after subperichondrial extirpation of the larynx. Instructions from some patient who has previously had a laryngectomy and can produce an esophageal voice aids greatly and encourages the patient. The artificial larynx of Mackenty can always be secured. The Bell Telephone Company furnishes it to clinic patients without cost. Repairs and replacements are also taken care of without cost to these patients, so that a mechanism for speech production is assured the laryngectomized patient.

Irradiation Treatment: Improvements in methods of irradiation with the use of qualitative as well as quantitative dosage as suggested by Coutard has greatly improved the results obtained. In the 360 consecutive cases considered here, all cases in which the disease extended beyond the larynx were recommended for irradiation treatment. Also all cases intrinsic in origin where there is glandular metastasis are referred for irradiation. In a special group of intrinsic cancers, although the location of the lesion and the cell grading justified surgery, the patients were referred for irradiation because of the poor surgical risk due to age, cardiovascular or other organic disease. It is noted that the results of irradiation were much more favorable in patients over 65 years of age than in the younger age groups.

It has been my privilege to follow with the roentgenologists at the Graduate Hospital, University of Pennsylvania, and the Hospital of the University of Pennsylvania a number of these cases, and particularly in the old age group good results have been obtained. All cases were palliated and a number were cured. It was noted that favorable results were obtained with old age group cases regardless of the cell grading. Grades 1 and 2 responded equally well with the grade 3 and 4 cases. The patients had very little discomfort. All were palliated and a number were cured. We have no means of determining the percentage of cure obtained by irradiation since the roentgenologists have not published their results. In the younger age group the results have been most disappointing.

Combinations of Irradiation and Surgery: The combined use of

surgery and irradiation in the treatment of laryngeal cancer has been used in a considerable number of cases. The results, however, have not been very encouraging. During the past three years I have had the opportunity of treating surgically a number of patients that had been treated by intensive irradiation and developed recurrences after a post-irradiation period of six months or longer. The results in these cases to the present time have been excellent. There have also been several cases in which the primary lesion was excised and recurrence developed. Irradiation was used in the treatment of the recurrence with excellent results. It would seem that the recurrence was more sensitive to irradiation therapy than the original lesion in these cases because in cases where the primary lesion had been of the same extent and irradiation was used instead of surgery, the lesion did not respond as well as the recurrence after excision of primary lesion. In glandular involvement that comes on months or years following laryngofissure or laryngectomy without local recurrence, surgical excision of the glands followed by irradiation has given excellent results. It is to be noted that by both methods of surgery, laryngofissure and laryngectomy, 70 to 85 per cent of the percentage of cures can be obtained without irradiation.

Irradiation therapy was used in a group of cases thought not to be amenable to surgery for reason of extent of involvement, contraindication to surgery in the patient's general condition, or where recurrence had taken place following surgical treatment. The improvements in surgical technic and in the technic of the use of irradiation, radium, radon implantation, and x-irradiation, will undoubtedly lead to greater number of cures and greater conservatism in the matter of radical laryngectomy than has previously existed.

Conclusions

1. Cancer of the larynx is curable in about 85 per cent of the cases that are suitable for laryngofissure when they come under the observation of the laryngeal surgeon. The most important essential in this high percentage of cure is early diagnosis. The symptoms that lead to this diagnosis are hoarseness and local discomfort. These symptoms must be recognized by the general practitioner as well as the specialist in laryngology as a possible indication of cancer until adequate examination proves them not to be cancer.

2. At least 70 per cent of all laryngeal cancer originates intrinsically and is amenable to surgical treatment, if the diagnosis is made while the cancer is still within the larynx.

3. In extrinsic lesions the proper application of x-irradiation will probably cure a greater percentage of cases than surgery. It is also noted that in individuals over 65 years of age irradiation has a much more favorable effect than in the younger age group. The morbidity after irradiation therapy, however, would seem to be as great, if not greater, than with the improved technic of laryngectomy. Laryngofissure, however, is the method of treatment of choice in all cases that are amenable to this procedure.

These observations are based on a consecutive series of 360 proven cases of cancer of the larynx treated by surgery and irradiation or a combination of surgery and irradiation. The statistics of the cases treated by irradiation are not available for report in this paper.

THE USE OF SULFANILAMIDE POWDER IN ABDOMINAL SURGERY

Q. B. Lee, M. D., F. A. C. S.
Wichita Falls, Texas

THE effectiveness of the sulfonamide group of drugs in the control of infections has become generally recognized. As yet we do not know the exact manner by which this bacterial action is accomplished, but it has been found that this action may be inhibited by decomposed proteins and peptones. This is of practical importance in traumatic lesions, as an improper or poor debridement leaves dead tissue, which disintegrates. The same is true to a lesser extent in an abscessed cavity, where the white blood cells are broken down in large numbers. The bacterial action of these drugs is accelerated in the presence of free oxygen, and thus hydrogen or zinc peroxide may be used to advantage in conjunction with the sulfonamide drugs, when they are applied locally to infected wounds.

Sulfanilamide is absorbed into the blood stream very rapidly from wounds, or the body cavities, and a high degree of concentration in a localized area is made possible within a very short time. The concentration may be eighty times higher than the ordinary blood concentration attained when the drug is administered by the mouth in therapeutic doses. By using the drug in this manner the surgeon has a potent weapon with which to fight the infection at the point of greatest need, and before the infection has time to spread to other areas.

My experience has chiefly been with the use of sulfanilamide and a mixture of sulfanilamide and sulfathiazole. The various drugs seem to be more or less specific in action but, as most surgical infections are of a mixed type, one might be as effective as the other.

These drugs have been used in practically all types of wounds, but are recommended most frequently in traumatic wounds and in abdominal infections. As a preventive of infection, one or two grams may be used in any wound. In the treatment of severe infections in the abdominal cavity, we have used as much as 10 Gm. The powdered drug is rubbed into the wound or peritoneum, where it rapidly dissolves, causing the wound to appear very red and oozy.

The powdered drug is prepared in test tubes in measured amounts, stoppered and then sterilized in the autoclave for 15 min-

From the Wichita Falls Clinic Hospital.
Presented before the Texas Surgical Society Semi-Annual Meeting, Temple, April 7 and 8, 1941.

utes, at 15 pounds pressure. It is then stored and used as needed.

In the presence of severe infection, such as peritonitis, the administration of the drug is continued by mouth, or intravenously, as indicated. However, I have not found this necessary in many cases, as I have obtained satisfactory results from local application at the time of operation.

While we have made routine bacteriologic studies in these cases, no attempt is made to classify them, as this report is based upon clinical appearance, morbidity and mortality, rather than on a bacteriologic study. In the majority of surgical wounds, there is a mixed infection, so that the chief offending organism may be difficult to identify, and a bacterial count is subject to many errors. Therefore, most surgeons while doing routine bacteriologic study, use this as part of a clinical study and depend upon the appearance of the patient, and mortality rates to determine the value of any given treatment.

The clinical advantages of the use of this drug are:

Patients expected to be seriously sick proceed more normally with lowered temperatures and the absence of septic symptoms.

Wound drainage has not been grossly purulent in nature. It is more of the type seen where drains are inserted merely as a precaution, rather than that seen in gross infections.

There have been no offensive odors of B. coli in the appendiceal cases, or discolored drainage in any of the wounds.

The healing has been rapid and satisfactory and no wounds have later broken down from infection.

Drainage tubes have been removed earlier, thus stimulating earlier healing and more rapid postoperative recovery.

Since I began this treatment, I have had no death from any type of infection in the abdomen.

In *traumatic lesions,* resulting in open wounds and compound fractures thorough mechanical cleansing and careful debridement of the wounds have almost eliminated infection, except in those cases which were very grossly contaminated with filth or by meddlesome first aid attempted under adverse conditions. Infection in these tragic cases can be almost entirely eliminated by the use of sulfanilamide, if seen within a reasonable length of time. Also, it is possible to use internal fixation without danger of drainage in many cases, thus assuring quicker and better end results.

When patients enter the hospital with mangled limbs and in great shock, sulfanilamide is poured into the wound and a dressing

applied. We can then wait until the shock is under control before proceeding with treatment of the fracture with a greater feeling of safety in so far as the time element of infection is concerned. We are now using sulfanilamide or sulfathiazole, or a mixture of these two, as a routine in the management of all of these cases. It is also being used in the treatment of osteomyelitis, both in the acute stages and after cleaning out the infection in chronic cases. The results are better, as shown by lessened drainage, quicker healing, and in some of the chronic cases, primary healing occurs after closure without drainage.

In *acute abdominal infections* the appendix is the most common offender in the abdominal cavity. In the Wichita Falls Clinic Hospital, it has always been the policy to operate upon practically all cases of acute appendicitis in whatever stage, as soon after the patient enters as possible. Patients in collapse, or after a long ride to reach the hospital, are given blood or intravenous fluids for a few hours and are then operated upon without delay. During the past two years all cases entering the hospital have been handled in this manner and all cases presenting themselves have been operated upon except one. This man had a generalized peritonitis and he refused an operation until he was moribund and we then felt that there was no chance for recovery. There have been 276 cases operated upon for acute appendicitis during this time, with one death. (Autopsy: uremia, hydronephrosis, congenital absence of kidney.) While this death was an incident, rather than a result of operation, nevertheless it is considered as such. During this same period of time, in 149 other abdominal cases, the appendix was removed as a routine procedure without a death. Since sulfanilamide was used in only the last 25 per cent of these cases, it cannot be given sole credit for the low mortality rate. However, during this time two cases were seen, which I believe would have been fatal had it not been for the local use of sulfanilamide.

Report of Cases

Case 1. General peritonitis, resulting from slight leak about the appendiceal stump:

This patient, who had a mild appendicitis, made a normal recovery without fever and was discharged on the seventh postoperative day. Three days later he was seized with violent abdominal pain and the following day he entered the hospital with symptoms of a generalized peritonitis, with marked ileus, so much so that the intestines could not be returned to the abdominal cavity.

Operation: Ileostomy: Eight grams of sulfanilamide was applied throughout the coils of the intestine and to the peritoneum. Three cigarette drains were inserted. The postoperative recovery was rapid. There was no breaking

down of the wound. The ileostomy wound closed immediately. The patient was discharged well in three weeks.

CASE 2. A child 4 years of age came in with a ruptured appendix and a large abdominal abscess formation. The child had been sick for ten days and was very septic. Blood transfusion was given and operation performed in twelve hours. At operation a large retrocecal abscess was found, and another abscess in the pelvis. This had spread upward, with a third abscess on the left side of the abdomen, along the descending colon. No attempt was made to remove the appendix. The pus was removed by aspiration, 4 Gm. of sulfanilamide powder was then applied and the cavities drained with cigarette drains. The child was critically ill for two days, largely from exhaustion. The drainage was not purulent in nature, but serous and there was no infection or breaking down of the wound. The patient was discharged on the fourteenth day, with the wound healed except for a small granulating area where the tubes were removed.

On previous occasions, we have had more than one hundred consecutive cases of appendicitis operated upon without a death, and then have cases like the above come in, and in a month's time change the mortality rate in a ruthless fashion. We feel that such would have been the case here had it not been for the use of sulfanilamide.

Pelvic Infections: Most of our pelvic infections are handled just like the cases of appendicitis. That is, we operate as soon as possible after admission. This rule has not been adhered to as closely as in appendicitis, due to the fact that they are able to take care of themselves better. However, this is often at the expense of ovarian function. Therefore, if we expect to operate, we prefer early operation.

CASE 1. Pelvic infection with abscess formation:

The patient entered the hospital with a "frozen pelvis," after being treated in a neighboring town until the infection was somewhat quieted down. Temperature was normal, but blood count showed 17,000 white cell count, with 84 per cent polynuclears. At operation, both ovaries were found to be abscessed and so distorted that all landmarks were destroyed. In liberating the right ovary from the pelvis, a rent was made in the mesentery of the ileum about 10 inches from the ileocecal valve. It lay between the abscess and the posterior abdominal wall. There was a large, collar-like mass of inflammatory exudate just proximal to the rent. Resection was considered, but the circulation was observed until after the other ovary was removed. The circulation was then deemed sufficient for life, but because of the flaccid bowel and the dense adhesions, ileocecostomy was decided upon. The abscess cavity and the area of the anastamosis were covered with 8 Gm. of sulfanilamide powder. Drains were inserted into the pelvis and to the outer side of the cecum. Convalescence was uneventful. The wound healed without infection, drainage was slight and the patient was discharged on the fifteenth day, with the wound practically healed.

Infection in the upper abdomen: Sulfanilamide has been applied to the gallbladder fossa in a number of cases of acute gangrenous

cholecystitis. Gallbladders were removed for two patients, who were past 70 years of age and recovery was uneventful. There has been no death or severe infection in any case since we began using this method of treatment six months ago.

Perforating ulcers of the stomach and duodenum: Only two cases of acute perforating ulcer have been treated in this manner and recoveries probably would have occurred under the regular routine treatment.

A chronic perforating ulcer on the posterior wall of the stomach, with persimmon phytobezoar and gall stones was operated upon. The stomach had to be separated from the pancreas with a cautery and then the end of the stomach opened at the time of resection to remove the phytobezoar. After doing a gastric resection and removing the gallbladder, sulfanilamide was used in the upper abdomen, in the region of the pancreas and about the stomach sutures. Recovery was rapid and there was no infection in the wound.

In reporting these cases, I have tried to select cases that could easily have been fatal. There have been many other cases in the upper abdomen, in which the method was used with good results, although the patients would probably have recovered under ordinary procedures.

Suture of the large bowel: There have been four cases of suture of the large bowel inside the abdomen. In none has there been any infection and satisfactory results were obtained in each case. This series of cases is not large enough to be of any particular importance, but they are cases that worry all of us, whether they be many or few.

An inguinal hernia was operated upon in which a previous infection had occurred from the injection treatment. At operation soap like bodies were found in the wound, carrying potential infection. Two grams of sulfanilamide was scattered in the wound and the wound healed primarily in a normal way. Since then I have used it in many hernias, with satisfactory healing and no infection.

Pilonidal Cysts: In my experience it has been very difficult to secure good wound healing in these cases. There have been four cases, two of which healed primarily. In one case, in which transverse incisions had to be made to dissect a number of openings, there was some breaking down and destruction of skin from poor circulation, with a slight amount of infection. However, this healed very rapidly following reapplication of sulfanilamide. The fourth patient went home in good condition but became infected from a blood clot. He returned and was dressed with sulfanilamide and

hydrogen peroxide and the infection cleared up immediately and the wound healed with excellent results. This may not appear to be very good results, but I feel that it is good when compared with my previous experience in the treatment of these cases.

Ischiorectal Abscesses: In all cases, sulfanilamide powder is applied at the time of operation on gauze packs and the wound is repacked from time to time. The odor is absent and the infection rapidly subsides, leaving a healthy looking wound.

This drug has been used rather extensively in our surgical dressing room, where a large number of minor injuries are seen. In the *open wounds* it has been used very effectively in the prevention of infection. In burns and abrasions, where the skin is not destroyed, evidently there is very little absorption and we have noticed very little difference in the appearance of the wounds. In some burns, while some areas were treated in a routine manner, other areas were treated with this powder covered with vaseline gauze. We noticed little if any difference in the appearance of the wound.

Summary

1. Sulfanilamide can be used locally in wounds, both to prevent and to treat infections.

2. It causes no interference with healing in wounds. On the other hand, wound healing has been hastened because of the absence of infection and secondary breaking down of the wound.

3. High concentration of the drug is made possible immediately at the point of infection, before there is time for spreading.

4. There has been no death from infection in any case in which we have used the drug. The length of illness apparently has been reduced and certainly the convalescence is easier.

5. This mode of treatment probably will not prevent infection in wounds where an incomplete debridement is done, or in the abdomen where rough handling and large sutures are used, but in the presence of severe infection, it has been found to be a distinct adjunct to other approved surgical procedures.

The Southern Surgeon

Published Monthly by
The SOUTHERN SURGEON PUBLISHING COMPANY
701 Hurt Building
ATLANTA

Subscription in the United States, $5.00

VOLUME X SEPTEMBER, 1941 NUMBER 9

STATISTICS

In an effort to arrive at conclusions with reference to the value of certain procedures we often attempt by statistical compilations to present our experiences for the benefit of the profession.

Life is short, time is fleeting, and experience is limited. Deductions to be of value must be as nearly all inclusive as possible. The accuracy of statistical data is dependent on so many factors, that a definite place as a mathematical science has been accorded to the field of statistics. The fundamental principles of this science are not clearly understood by the majority of us.

If statistics are to be of real value every factor must be considered.

End results are dependent on so many variable factors that statements often made in good faith give an erroneous impression and lead to a false sense of security on the part of some.

The personal equation, which includes individual experience, technical skill and accurate knowledge, combined with almost ideal hospital environment, equipment, and personnel lead to better end results than are generally obtained. It would hardly be fair to compare end results, morbidity and mortality, from a well organized institution with those obtained by the occasional operator who has only indifferent equipment and associate personnel.

The time factor in acute surgical diseases, particularly, of the abdomen makes comparison of statistics as to the value of treatment inadequate for guidance of the profession as a whole.

The character of the clientele is a factor which must be reckoned with if data which are to be presented are to be of value. The more

highly intelligent, the better the financial status of the individual, and the proximity to institutions where skilled management of the case can be obtained are factors which though intangible cause marked variations in end results.

It is not fair to compare statistical results from private practice by skilled surgeons and the results obtained in large public institutions where the clientele is made up of the underprivileged and in many instances the more ignorant class of patients.

It is admitted that in carcinoma of the breast the earlier the diagnosis, the greater will be the incidence of localization of the disease to the breast.

If such cases are reported from an institution where the personnel is skilled, where the diagnosis is made early the end results are bound to be more flattering than where the operating group is larger, and where the disease is no longer localized to the original organ.

Statistics to be comparable must share the same type of patients and with the disease at relatively the same period in its development. One must consider the actual condition of the patients at the time of operation, and the degree of skill of the group responsible for the care of the patient should be comparable.

No one will deny that preoperative preparation and study of patients generally is not comparable. The physical condition of patients, as well as their age groups alter end results.

Statistics to be of value must represent a cross section of the results obtained under all conditions. Unfortunately there is no way by which one can obtain universal reporting. Even death certificates do not always reflect the true condition.

Diffusion of knowledge among the laity and the profession, the use of universal standards of comparison and the interpretation of results by impartial observers, the raising not only of standards, but insistence on the maintainence of standards of record keeping in hospitals will aid in obtaining statistics which will reflect the true condition.

Reports made too early on a few cases in no way reflect the exact status of a procedure, the incidence, or gravity of a particular disease.

When using supposedly the same procedure results are not comparable.

This last statement sounds almost paradoxical, yet if the originator of a particular method were to walk into an operating room to observe a procedure supposed to be one devised by him, he might

fail to recognize the method. No better illustration of this statement can be made than the radical breast operation. It should be sufficient to say that there are radical breast operations and radical breast operations. A factor of importance in comparing end results is that often generic terms, such as, cancer of the breast are used instead of breaking down the group into their pathologic types.

Where the majority of cases fall into one group; results are better or worse, dependent on the relative malignancy of the group. Here difficulties are met because of personal equations with reference to interpretation of histopathologic findings. That there are differences in groupings of malignant disease by pathologists is hardly open to question.

What applies to malignant disease, applies equally well to results of trauma. All too often statements based on statistical compilations after a short period of time give a hopeful view whereas end results, if collected after a period of years, would definitely alter the statistical findings.

Statistics can only be of value where all factors are considered. There are many loopholes for error. One must be careful in accepting the ultimate value of statistics which are compiled by the average record department.

In substantiation of the foregoing statement, I would like to quote Frederick Hoffman:

> After fifteen years of continuous observation of the cancer trend throughout the world, I have become convinced of the utter futility of drawing useful conclusions from general cancer death rate not segregated or studied with reference to the particular site of the primary lesion and the local incidence of such lesion proportionate to the population affected.

Statistics are valuable in proportion to the ability of the statistician and his use of all possible factors. Statistics should be used only to prove truths.

—Isidore Cohn, M. D.

THE 1942 POSTGRADUATE SURGICAL ASSEMBLY TO BE IN ATLANTA

At the Richmond meeting of the Executive Council in March, cordial invitations for the 1942 Postgraduate Surgical Assembly of The Southeastern Surgical Congress were received from several cities. This Assembly has grown so large that the Southeast has only a limited number of towns big enough to hold it. Because of the uncertainties of the future the Council concluded it was best to defer the decision as to the place for the 1942 meeting. In the meantime the hotel accommodations, rail, air and other facilities in the various cities were carefully canvassed. It would appear that in March, 1942 conditions will be more unsettled than they have been at any time since World War I, and it therefore seemed necessary to get up the finest program ever, with especial attention to military medicine and the national defense. Such a program is being formulated, although high ranking officers in the service of the Government have had to make their acceptance provisional. To get such men required in turn that the Assembly be held in a city readily accessible by air. Central location was thought advisable moreover in order to make it easy for the largest possible number of Fellows to attend. At a recent meeting, therefore, the Executive Council decided on Atlanta as the site of the 1942 Postgraduate Surgical Assembly; the dates to be March 9, 10 and 11.

MILITARY SERVICE, III

The Editors of THE SOUTHERN SURGEON desire to record the military activities of the Fellows of The Southeastern Surgical Congress and of the Texas Surgical Society. They request each man who is called to active service to notify them so that the fact may be recorded in these pages and the Journal may follow him.

This month the Navy seems to be in the ascendant, as our only news about Fellows in active military service concerns Atlanta men called into the Navy. We feel sure that a number of others have been called, and we would like to know who they are and where they have gone: we again ask for such information.

Lieut. Wadley R. Glenn is serving with the U. S. Naval Air Station near Atlanta.

Lieut. Carl C. Garver is on active duty at the U. S. Navy Recruiting Station, Macon.

Lieut. Samuel D. Murray is stationed at the U. S. Naval Hospital, Pensacola.

SECTIONAL MEETINGS

The eighth annual clinical conference of the Florida section of The Southeastern Surgical Congress, held at the Orange General Hospital, Orlando, on August 7, was well attended. Dr. Frederick J. Waas, of Jacksonville, presided. Luncheon was served at the Hospital and the afternoon session was concluded in time for the annual barbecue of the Orange County Medical Society at the Dudsdread Golf Club. As one Georgian described it, "the hospitality was unsurpassed and everything was done for our comfort and pleasure." The program follows:

Traumatic Surgery (lantern slides): Dr. Robert L. Rhodes, Augusta.

Gastroscopy (lantern slides): Dr. James L. Borland, Jacksonville.

Medical Conditions Simulating the Acute Abdomen: Dr. Allen H. Bunce, President, Medical Association of Georgia, Atlanta.

Sulfonamide Therapy in Treatment of Compound Fractures (lantern slides): Dr. Thomas P. Goodwyn, Atlanta.

Carcinoma of the Large Bowel (moving pictures in colors): Dr. J. K. Quattlebaum, Savannah.

Breast Tumors (lantern slides): Dr. William Perrin Nicolson, Jr., Atlanta.

Thoracic Surgery (lantern slides): Dr. Robert C. Major, Atlanta.

Deviation of the Urinary Stream (moving pictures): Dr. Robert B. McIver, Jacksonville.

The clinical conference of the Georgia Section will be held in Thomasville about the middle of September. Dr. C. K. Wall, chairman of the local committee, had not announced the program at the time of going to press.

BOOK REVIEWS

The Editors of THE SOUTHERN SURGEON *will at all times welcome new books in the field of surgery and will acknowledge their receipt in these pages. The Editors do not, however, agree to review all books that have been submitted without solicitation.*

THE STORY OF CLINICAL PULMONARY TUBERCULOSIS. By LAWRASON BROWN, M.D., Late Director of Trudeau Sanatorium; Lecturer in Trudeau School of Tuberculosis; Author of "Rules of Recovery from Tuberculosis," etc. 411 pages. Price, $2.75. Baltimore: The Williams & Wilkins Company, 1941.

Dr. Osler's lively interest in medical history inspired a like interest among his disciples; their influence is probably largely responsible for the present widespread appreciation of its fascinating importance. Famous among Osler's students was Lawrason Brown: Brown made his hobby research in the history of clinical tuberculosis. Further, his intimate association with Trudeau at Saranac Lake got him in on the ground floor of the modern phases of phthisi ology.

This book represents primarily lectures delivered by Dr. Brown in various parts of the United States. These lectures have been edited by Mrs. Brown and his associates and amplified with a chapter by Sampson on roentgenology, and another by Archibald on the surgical treatment of pulmonary tuberculosis. Archibald gives Brown full credit for interest in this the latest of methods employed against phthisis. It is only in this chapter that the uninitiated can learn that Brown was himself a great physician.

The friends of Lawrason Brown—and the list of them includes not only all of the patients he saw but also every doctor who ever met him—will welcome this posthumous book—chiefly because it carries the imprint of his personality. They will also value it, as will all who read it, because it contains so much historical research presented with charm.

THE INTERVERTEBRAL DISC WITH SPECIAL REFERENCE TO RUPTURE OF THE ANNULUS FIBROSUS WITH HERNIATION OF THE NUCLEUS PULPOSUS. By F. KEITH BRADFORD, M.D., Houston, and R. GLEN SPURLING, M.D., Louisville. 158 pages, with 45 illustrations. Price, $4. Springfield: Charles C Thomas, Publisher, 1941.

When we studied anatomy the intervertebral disc seemed about the least important part of the whole body: it functioned as a sort of shock absorber and it never occurred to us it would become of great clinical importance. Then in 1934 Mixter and Barr demonstrated that root compression as a result of disease of the intervertebral disc was a common cause of severe sciatic pain. Few innovations have been as promptly and enthusiastically accepted, and glorious success resulted from operations for herniation of the nucleus pulposus in cases properly studied. However it cannot be denied that more than one such operation was done for severe backache or intractable sciatica without real justification and few of these helped. It is therefore about time that a comprehensive monograph in this field should appear. It gives us double pleasure then that the need for such a monograph has been filled by two old friends of THE SOUTHERN SURGEON.

Bradford and Spurling discuss the embryology, anatomy, physiology and pathology of the intervertebral disc; the clinical and roentgenologic investigation of patients with low back and sciatic pain; treatment and end results and, most important, differential diagnosis. They include several good case reports. They write clearly and their illustrations are well chosen and clear.

They include a bibliography of no less than 258 references. Throughout they have kept their feet on the ground.

The book is earnestly recommended to all who see patients with severe backache and sciatic pain that persists, and especially to those who attempt to relieve such patients.

COLLECTED PAPERS OF THE MAYO CLINIC AND THE MAYO FOUNDATION. Edited by RICHARD M. HEWITT, B.A., M.A., M.D.; A. B. NEVLING, M.D.; HARRY L. DAY, Ph.B., M.D.; JOHN R. MINER, B.A., Sc.D.; JAMES R. ECKMAN, A.B., and M. KATHARINE SMITH, B.A. Volume XXXII. 1190 pages, with 210 illustrations. Price, $11.50. Philadelphia and London: W. B. Saunders Company, 1941.

Fittingly this thirty-second volume from The Mayo Clinic opens with a section on military medicine. The modern airplane has emphasized the importance of oxygen in the human economy: Walter Boothby's years of research as to oxygen requirements have made him a most valuable man in national defense: one may almost wonder if he is not himself surprised to find how important he is. Other subjects dealt with are treatment of shock, blood plasma, intravenous anesthesia, various fractures and, of course, the sulfonamides.

The section of the alimentary tract reveals that at the Clinic they now operate occasionally for cardiospasm. Cancer of the stomach still challenges the diagnostic acumen of the profession, but in operable cases the results are constantly improving.

It is not possible to take up each section. Suffice it to say that the original research carried on at the Mayo Clinic, both in the fundamental sciences and in clinical medicine and the conclusions based on the large numbers of cases treated make this book, which summarizes the most important work, invaluable. Moreover, while many new theories are projected, many discoveries are made, many new methods of treatment devised in other parts of the world, those that are full of promise are usually promptly investigated and evaluated there. The volume is therefore indispensable to the surgeon and to the general practitioner who aspires to keep abreast.

PHYSICAL MEDICINE: THE EMPLOYMENT OF PHYSICAL AGENTS FOR DIAGNOSIS AND THERAPY. By FRANK H. KRUSEN, M.D., F.A.C.P., Associate Professor of Physical Medicine, the Mayo Foundation, University of Minnesota; Head of the Section on Physical Therapy, the Mayo Clinic; Member of the Council on Physical Therapy of the American Medical Association; Past President of the American Congress of Physical Therapy; Past President of The Academy of Physical Medicine. 846 pages, with 351 illustrations. Price $10. Philadelphia and London: W. B. Saunders Company, 1941.

As we all know, an unintelligent person may receive advice that will improve his health and prolong his life for years, and yet, because "the doctor didn't do anything," feel that he has gotten nothing. If however the physician does something tangible, perhaps hurts him or at least gives a dose that produces obvious action (and we fancy that this is why so many prescribe purgatives for the common cold), the patient may pay his bill more enthusiastically. For such reasons, methods of manipulation, electric shocks, "colonic irrigations" and such like have provided a lucrative field for charlatans. In reaction to this, many conservative physicians have not been sufficiently interested

in the physical methods of treatment, although this branch of medicine has a long and honorable history (the author of this book terms it "at once the newest and the oldest field of medical practice"). It is therefore fortunate to have a large volume devoted to it.

Physical therapy suggests to most of us massage and passive exercise following fracture, or perhaps, in a vague sort of way, what they do to victims of polio at Warm Springs. Further consideration will bring up "ultra-violet," diathermy, perhaps artificial fever (one notes that, since the introduction of the sulfonamides, the hot box is less frequently used in Rochester for the treatment of uncomplicated gonorrhea) or perhaps the "Elliott treatment." In passing, this reviewer had not considered the ice cap or the time-honored mustard plaster forms of "physical therapy," nor postural training and corrective exercises. Krusen takes up all these methods and many more. He discusses the physics and the physiology involved, the indications and contraindications of the various methods, and gives technic in considerable detail.

Certainly there should be a copy of this book in every hospital library, even in those hospitals which do not boast of a department of physical therapy. One is tempted to say that every physician too should at least have access to this book in order to learn what can (and what cannot) be done by means of physical therapy for the comfort and benefit, if not the more rapid cure, of many of his patients.

ORBITAL TUMORS. By WALTER E. DANDY, M.D., A.B., Adjutant Professor Neurological Surgery, Johns Hopkins Hospital, Baltimore. 168 pages, with 100 illustrations. Price, $5. New York: Oskar Piest, 1941.

In this monograph Dr. Dandy reports twenty-four cases of orbital tumors removed by the intracranial route. He points out that from 75 to 80 per cent of orbital tumors either have their origin intracranially or extend secondarily into the cranium, and are, therefore, primarily, a neurosurgical problem. Furthermore, it is pointed out that by lifting up the frontal lobe of the brain, and entering the orbit by removing its roof, the entire orbit can be easily explored and the tumor attacked without the danger of damaging the important nerves and muscles of the orbit.

The advantages of this approach for the surgical removal of tumors of the orbit have been recognized by neurosurgeons for many years, but there has been little publicity on the subject. This timely monograph will serve to standardize the intracranial approach for orbital tumors.

The cases are fully reported as to history, physical findings, methods of diagnosis, operative treatment, pathologic studies, and follow-up reports. There are one hundred photographs and artist's drawings to illustrate the cases presented. —EXUM WALKER, M.D.

NECROPSY: A GUIDE FOR STUDENTS OF ANATOMIC PATHOLOGY. By BELA HALPERT, M.D., Assistant Professor of Pathology and Bacteriology, Louisiana State University School of Medicine, and Visiting Pathologist, Charity Hospital of Louisiana at New Orleans. 75 pages. Price, $1.50. St. Louis: The C. V. Mosby Company, 1941.

This handbook from Tulane says a great deal in as few words as possible. It is safe to say that if all the autopsies in the United States were done according to this outline more than 75 per cent of them would be improved.

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The Southern Surgeon is now published monthly. Subscription price in the United States and Canada: $5.00; in other countries: $6.00, including postage. Single Copies, $1.00 postpaid.

Checks may be made payable to The Southern Surgeon Publishing Co.